HOW MAN CONQUERED NATURE

REYNOLDS

EVERYCHILD'S SERIES

EVERYCHILD'S SERIES

HOW MAN CONQUERED NATURE

EVERYCHILD'S SERIES

HOW MAN CONQUERED NATURE

BY

MINNIE J. REYNOLDS

ILLUSTRATIONS BY FLORENCE R. A. WILDE

New York
THE MACMILLAN COMPANY
1914

Set up and electrotyped. Published June, 1914. Reprinted November, 1914.

Norwood Press
J. S. Cushing Co. — Berwick & Smith Co.
Norwood, Mass., U.S.A.

CONTENTS

HOW MAN CONQUERED NATURE

CHAPTER I

The Conquest Begun

THIS is a story, the most wonderful story ever told, a story older than any other on earth, a story in which you and I and all of us have a part.

To begin it, you must think back more than a hundred and fifty years, when our American Revolution took place; more than four hundred years, when Columbus discovered America; more than two thousand years, before Christ lived in Judea. You must think back before there was any history, before there was any alphabet, before there were any cities or villages, back to the time when the earth was just a great stretch of forest, mountain and plain inhabited by wild animals. We do not know how long ago this was, but it was many thousands of years. Man has probably existed

on this earth at least two hundred thousand years. History goes back only five thousand years. It is only yesterday that man began to keep a record of his own doings.

When we say "man" in this story, we mean men and women — the human race. Just as when we say "the lion is a fierce beast," we mean the lioness as well as the lion.

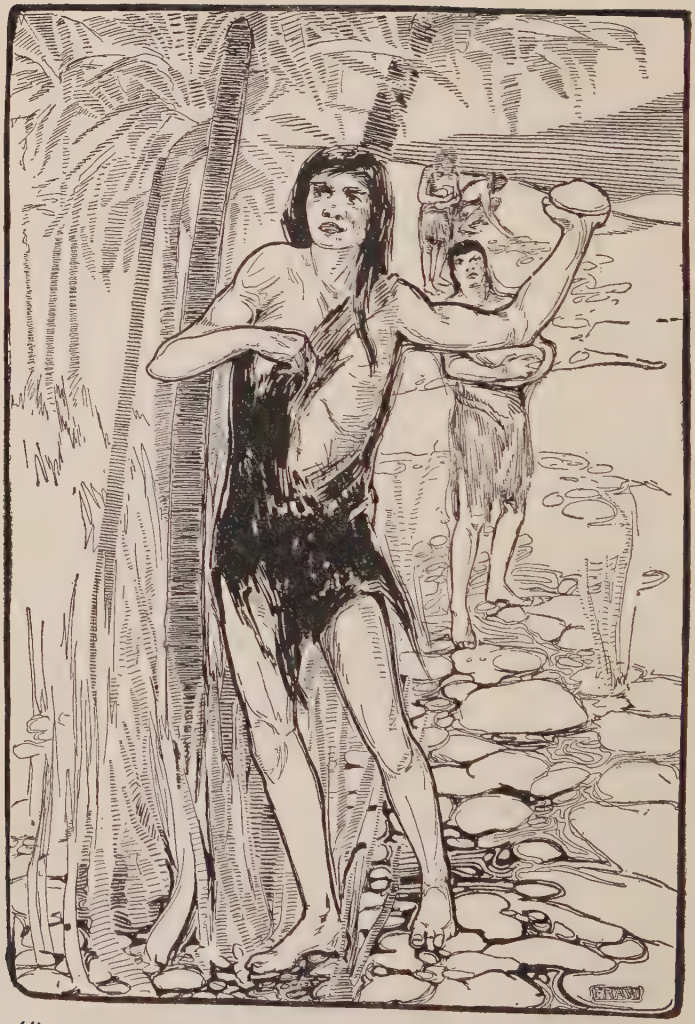
Some of the animal families with which man started the race have vanished from the earth. They have been killed off by man, or have died out from other reasons. A few others, like the horse, dog, cow and sheep, have changed very much, because man has taken charge of them, as we shall see later. But what we call the "wild animals" remain practically the same now as when the story starts, many thousands of years ago.

Among these wild animal families, man was one. There was not much to distinguish him from the animals around him. Like them he killed other animals for food and ate them raw. Like them he ate the wild nuts, fruits, seeds and roots. With his shaggy, uncut hair and his hairy

body, he did not look very different from the big apes that lived in the trees. He had no schools, churches, villages or government. He had no house, except a hole in the rocks or a shelter of boughs in the woods. He had no tools, he had no weapons. He was just one of the animals, fighting for food among the other animals.

The first step in the conquest of nature was made when man picked up a stick or a stone and used it to kill other animals. He had no great teeth or claws like the lion or tiger. He could not run from his enemies like the rabbit or the wild horse. He could not leap like the panther or strike poison like the snake. He was weak and helpless among these creatures. His first step in conquering them all was to pick up a stick or a stone. He had found his first weapon.

This first step in the great conquest was possible because of what we call the "opposition of the thumb." If man's fingers were arranged side by side, he could not hold things in his hand so as to work with it as he now does. In that case it is doubtful if he could have survived in his present form. Without his thumb he could



(4) "He had found his First Weapon."

not have used tools in any such way as he uses them now.

But with thumbs set opposite the fingers, he has been able to protect himself with weapons, shelter, clothe, and feed himself and use implements of his own manufacture to build and dig.

But man is not the only animal that possesses a thumb. The apes and monkeys also have thumbs opposite their fingers. They, too, can handle sticks and stones. They will pick heavy cocoanuts and shower them on other animals below. The organ grinder's monkey uses his thumb to carry his little plate for pennies from window to window. And the apes and monkeys are very intelligent animals. Trained by man in captivity, they do things that seem almost human. They can be taught to sit up at the table, use napkin, knife, fork and cup and to do many other things in a humanlike way. All this probably comes from the fact that they have a hand which, like man's, can hold and use utensils. The apes and monkeys are man's first cousins, more like him than any other animals.

But even at the very first there was a great

gulf between man and the monkeys. Man picked up a stone or a stick and, like the monkeys, used it to throw or to strike. But then he saw that the stick would make a better weapon, if he shaped it with the stone. He scraped off one end to make it smaller, so that he could grasp it easily with his hand, and he shaped the other end so as to leave it large and thick. Then he had a club. Or he scraped one end down to a long, tapering point. Then he had a wooden spear. His club and his spear were far more dangerous weapons than a common stick. Unless some man taught him in captivity, the smartest monkey that has ever lived could not have made a spear out of a stick. Evidently there was from the very first some strange and wonderful difference between man and the monkey.

This difference is not in the body. Hands, feet, limbs, lungs, eyes, are all similar. The ape is far larger and stronger than man. Apes and monkeys are better climbers than man, and have a natural coat of fur to protect them from the weather, so that they do not have to bother about clothes. At the beginning of the race,

these animals had an advantage over man. Why is it that man has gone so far ahead of them?

The difference which made it possible was an inner one. If you should open the skulls of a man and an ape, and look at the brains inside, they would look very much alike. Each would be a mass of soft, grayish matter. But the brain of the ape would be smoother than that of the man. In the brain of the man you would see ridges, or furrows, deeper than those in the ape's brain. Whether the difference lay in these deeper "convolutions," as they are called, we do not know. But we do know that man's marvellous conquest of all the other animals, and of the earth itself, has come not from a stronger body but from a better brain. The mind of man is the most powerful thing in the universe.

One of the first and greatest advantages which man gained over other animals was the use of fire. Nothing man has ever gained since has been so valuable to him. Many things he has since gained depend on fire. Without fire there would be no cooked food in the world. Without fire we could have no steam or electricity, and there

would not be a factory or a railroad in the world. Without fire we would not have so much as an iron hammer or knife in the world, for we could not work metals. Almost everything we have and use and do is made possible by fire.

Fire must have come first from lightning. Some lightning flash set a dry tree on fire. Through the forest roared a vast conflagration. Out of it poured man and the other animals, and huddled in a frightened group, their enmity to each other forgotten as they watched this terrible enemy of all. The fire roared itself away, and then, perhaps, some man or woman found the body of an animal cooked. Perhaps they ate it and liked it better than raw meat. Perhaps they found that the remains of the fire kept them warm at night, gave them light in the dark and frightened away the other animals; for all other animals are afraid of fire. So they learned to cherish the dying embers and keep the fire alive. Man was the only animal who thought enough to do this. All the others had the same chance, but he was the only one that conquered the fire, this wonderful helper that nature had given him.

It was immensely important that this fire should be kept alive, for there was no way to light it again, if it went out.

Probably it was then that a difference in the work of man and woman began. Before this the woman had doubtless roamed the forest like the man, hunting, fishing and gathering nuts and fruits. But when it became very important to preserve the fire, it was the woman who was left to do that. She was not, perhaps, as good a hunter as the man, perhaps was not as large or strong, and she was hampered by the children, who clung to her and held her back. So she began to stay behind to tend the fire and the children. And, as it was very hard to carry the fire a long distance without its going out, the family became more attached to one spot than it had been before. The hunter roamed the forest, and came back after his trips to his fire and his family.

The immense importance of fire to primitive peoples is shown in various religions. When a thing is very important and necessary to primitive man, it becomes sacred to him, and he weaves his religion about it. Some tribes have been fire

worshippers, considering fire a god which could destroy them. Fire has been greatly used in the religious ceremonies of primitive peoples. We read in the Old Testament of the altar fires of the ancient Jews, and of the animals they burned there as sacrifices. They thought that to bring their lambs and burn them as a sort of present or offering to God would make God forgive their sins and send them blessings. Other tribes threw their own children into the fire. They had such a dreadful idea of their god that they thought it would please him for them to offer their children as burnt sacrifices.

The Romans, who came long, long afterward, and were one of the greatest peoples that ever lived, maintained a curious custom that came down from this primitive fire and the women who guarded it. Long centuries after that savage hunter's home in the deep forest had passed away, when Rome had splendid palaces and temples, great armies and navies, they kept burning a sacred fire in the chief square of the city. For hundreds of years this fire never went out. It was tended day and night by women who were

called Vestal Virgins. They were chosen from the best families in the city, they were not allowed to marry, and they were among the most powerful and important persons in Rome. The Romans believed that so long as this sacred fire was kept burning Rome could not fall.

Such things as these teach us how very, very important the fire was to primitive man. The hunter returning through the forest, when he caught the cheerful gleam of the flames through the trees, knew that his own people were waiting for him there. If he found the place dark, the fire all out, then indeed he knew that enemies had been there in his absence, and killed or carried away his family. So the fire came to stand for home. Even now in stories and poems you will see such expressions as "the hearthstone," "our own hearthstone," meaning the home.

The moment that man learned to control and use the fire, he leaped at one bound to a place far ahead of any other animal. He had not only conquered the cold and the dark, but he had gained power to do many things impossible without fire.

An interesting instance of this was shown by the native Tasmanians. Tasmania is an island south of Australia. When the first white settlers went there, the native tribes had only two tools or weapons, — the wooden club or spear, and the rough stone scraper I told you of. They had no metals, and of course nothing made of metal or by metal. They grew no crops, lived only on game, fish and wild roots and fruits. They were not in their mode of life far above the animals around them.

But the Tasmanians had fire, and they did one thing by means of it which showed them to be far above the lower animals: They burned little clearings in the forest. In these open meadows the kangaroos would collect to feed, and the Tasmanians could then catch a lot of them together, and kill them more easily. The cleverest ape that ever lived could never have done this.

The Tasmanians could also produce fire. They did it by twisting one stick in the hollow of another, until it burst into flame. All savage tribes that white men have found have known how to do this. The first thing that man noticed about fire was

its heat. He noticed too, perhaps, that when rubbed together very hard, objects will get hot, as if they had been near the fire. He saw that wood burns in fire. Either by chance or by reasoning it out, he discovered that rubbing two bits of wood long enough, in a certain way, would produce fire. We do not know how primitive man made this wonderful discovery. But it was more important to him than steam or electricity is to us. Now, indeed, he was master of the fire. He could not only use it, but produce it — a marvellous step forward in the conquest of nature. He became Man the Fire Maker.

Possibly woman, who was the guardian and tender of the fire, discovered the way to produce it. With all this talk of weapons and hunting, you may get the idea that it was only man who conquered nature. But all this time woman was carrying on a very important conquest of nature. Primitive man was a killer. He produced nothing. He only killed beasts, and fish and other men. It was immensely important for him to do this, because it meant both food and safety.

But woman was the first harvester, the first storer of food. She collected the wild fruits, nuts and edible roots, and stored such of them as could be kept for winter. She dried berries. She even collected the seeds of wild grasses and ground them between two stones into meal to feed her family. Women of the California Indian tribes make baskets as large as barrels and fill them with acorns for winter. Women of the Mojave Indian villages in Arizona make a great round basket like a cistern or tank, which they set up on posts to hold their winter supply of beans. Women of the African tribes make a dome-shaped hut of clay to hold their corn. The whole business of collecting and storing food for winter was begun by primitive woman. The huge cold storage houses and grain elevators of to-day are only her idea worked out on a bigger scale. It was a great step in the conquest of nature to preserve food. Without this knowledge man could hardly have lived in any country where there was winter. Every housewife who cans, in summer, fruit for winter use is carrying on the same sort of conquest of nature that the primitive woman did

long ago. And the great canneries, which send out millions of cans of peaches, peas, beans, tomatoes and other fruits and vegetables, have simply adopted the woman's idea.

Woman was the first miller. She invented the mortar and pestle. She looked till she found a stone that had a hollow on one side. In this hollow she placed the seeds of the wild grain which she had collected, and then crushed them with another stone or with a wooden block. Then she ground this crushed grain into meal between two larger stones. This meal or flour she mixed with water and baked in thin flat cakes like griddle cakes. She was the first baker, the bread maker, as she has always been, in the house. The housewife to-day makes her bread from flour which she buys from the storekeeper, who bought it from the miller, who bought the wheat to make it from the farmer. But the wild woman thousands of years ago went out and harvested the wild grain herself, came home and ground it into flour for herself, and then baked her bread.

How do we know these things? We know them because women of wild and half wild tribes

"Woman was the First Miller."

are doing the same thing to-day in many parts of the world. Among some of the American Indian tribes to-day, among the wild negroes of Africa, among the brown tribes who live in the islands of the South Pacific, it is always the women who grind the corn and build the granaries.

The Indians of our southwestern states eat the little white nuts of the pine, called piñon nuts. Early in the autumn the women beat the cones from the trees, gather them in baskets and spread them to dry. When the cones crack, the women beat out the nuts, rake off the cones, and store the nuts in a dry place among the rocks. When roasted, the nuts are eaten dry, or made into soup.

Wherever primitive tribes have been found, tribes living as all men once lived, on wild animals and plants, women have been found harvesting the wild vegetable foods, and in a country where there was winter, storing them. In Polynesia it is taro and breadfruit which the women harvest. In Africa it is palm nuts and tapioca, millet and yams. In Asia it was rice, in Europe the cereals. In America, corn, potatoes, acorns and piñon nuts.

From harvesting and storing the wild foods, it was but a step to cultivating them. Woman was the first farmer, the first gardener. She saw that she had to wander far and wide to find the roots and seeds she wanted. She saw that she could plant them near her hut, and not have to go so far to gather them. She found that stirring the earth around them with a pointed stick, or a sort of scraper, would make them grow better. So she invented and used the digging stick, the hoe, even a rude plough. Livingstone, the first white man to explore the heart of Africa, found a two-handled hoe, which two negro women dragged between their rows of vegetables to cultivate them.

Among savage tribes woman was the cook, as she has always been. She invented cooking. The first cooked food was the roast. The piece of meat was hung on a stick before the fire and turned around to cook each side. Or it was wrapped in leaves and laid among the ashes. But she invented far more delicate cookery than that. She boiled wild fruit with flour and honey, to make a sort of fruit pudding. She made a sauce for meat of wild peppers. She was the first sugar

maker. She cut the wild reeds that contained the sugar, and dried them. Then she ground them up and sifted out the finer part from the husks. Then she cooked this meal into a thick gummy mass like taffy, and the little Indian children had their first candy.

The most important of all woman's discoveries in cooking was leaven. Leaven, which we call yeast, or baking powder, is what makes real bread. Mix up a little meal and water, or flour and water, at home, and bake it, and you will see the difference between that and real bread. It will be hard as stone, or tough like leather. This is what bread would be without yeast or baking powder or some other kind of leaven in it. The Bible speaks of "unleavened bread." Unleavened bread is the dried cakes of flour and water which people in old times used.

Now if some of this flour and water mixed into dough is left standing uncooked, it will sour, or ferment. And if some of this sour dough is put into the fresh dough, the fermentation in it will make the loaf rise high in the pan, and will make the bread light, spongy and good, as we know it.

It was a great step in the conquest of nature when women found out this, and learned how to make real bread, for bread is the great staple food of mankind. We call it the staff of life. But no primitive woman in the forest ever discovered this. Savage tribes have no real bread. They have only hard, leathery unleavened cakes. Woman had got well along toward civilization when she discovered that the sour dough would make the bread better.

Woman was the first salt maker, boiling the salt water in great stone pots till the water was all gone, and the salt was left in white cakes. When we remember how we must all use salt, we can see what a step in the conquest of nature this was. Woman was the first curer of meat. To-day there are huge factories in Chicago and elsewhere, where thousands and thousands of animals are killed each year, and the meat "cured," — salted and smoked for ham or bacon, or put up in cans for use when we have not fresh meat. Woman was first to do anything like this. When the man killed a bear or a deer or a buffalo, and the meat could not all be eaten fresh, she learned

to cut it in long strips and dry it in the sun. Then she beat these dry strips with a stick until the meat was nothing but a powder. She would crush the large bones of the animal with a stone mall, pick out the marrow inside the bones and melt it. Then she would pack the powdered dried meat in a long sack of rawhide, pour the melted marrow over it, and close up the sack, which would be full of meat, like a sausage skin. This was the famous "pemmican" of our western Indians. The women made it after the annual buffalo hunt. It was impossible to use up all the buffalo meat fresh, so the Indian women made great quantities of this pemmican. It keeps a long time. When our soldiers first went out upon the western plains to fight the Indians, the government bought this pemmican and served it as rations to the soldiers. Although it smelled bad enough it was found to be a very nourishing food.

Savage women dried clams, oysters and fish also. Why did they not cure their meat with salt? No savage woman ever thought of that. Salted meats are a product of civilization.

All these things were steps in the conquest of

nature. If the primitive woman had not learned to gather, store and preserve food in this way, primitive man would not have spread very far beyond those hot countries where food grows all the year around.

In the beginning man furnished the meat food, and woman furnished the vegetable food. And it is curious how the ancient habits of that dim beginning have come down to us. Men still love to go hunting and fishing, though they need no longer do so for food. And in the country it is the women who "go berrying," just as they used to in the forest thousands of years ago.

CHAPTER II

First Manufactures

MAN could pick nuts and berries and eat them without making anything. And woman could gather acorns and store them in a hole in the rocks without making anything. But when man sharpened a stick into a spear, or woman sharpened one into a digging stick, these were manufactured articles. Nature does not furnish a spear or a hoe. They are manufactures of man. One of the greatest differences between man and the other animals is that he makes things.

All clothing has to be manufactured. Nature does not provide it. The wild people of hot

countries wear very little clothing. But the primitive man who survived in any country which had a winter had to have clothing, and plenty of it.

Woman was the first furrier, leather maker, clothier and tailor. She skinned the animal the man had killed. She scraped off all the meat and fat from the skin. If she wanted leather instead of fur, she heated the hide and then scraped off the hair. With a sharp stone she cut the hide in the shape she wanted. When it was dry it kept this shape. Sometimes she chewed the hide to make it soft and pliable. She took a bit of sharp-pointed bone and punched a hole through the larger end. This she threaded with the dried tendons of some animal, or perhaps the tough fibre of some plant, thus sewing her garment together. The fine steel needle made by the factories and the cotton or linen thread are far better than the thread and needle of this poor savage woman. But they are the same in form and purpose. Civilization took the wild woman's thread and needle and made them better, that is all. She invented them.

With this primitive thread and needle she made

strong clothes of furs, warm enough for the coldest winter, warm enough for the Esquimau to wear amid the ice of the Arctic. She made beautiful feather robes of birdskin, fit for a king to wear. She made soft, rich cloaks of squirrel skins. The Indian women did all this, and do it to-day in some parts of the American continent. To-day the Esquimau women make all the fur clothing worn by their tribes. Long, long ago, the ancestors of the Americans, English, French and Germans were skin-clad savages living in the wild forests of northern Europe. And in that distant day the women made the clothes in just the same way. The bone needles that some of them used have been found in caves, and are preserved in museums.

All this was a conquest of nature. Nature does not give man clothing. He conquers her when he learns to provide clothing for himself.

One article of wear invented by the primitive woman was of immense importance in the advance of the human race. Horses have a hard, tough hoof like bone or horn. And yet man has found it necessary to nail a shoe of iron on the

horse's hoof, so that he may travel well and be of more use. Without this iron shoe he soon grows lame. Man has a soft, tender foot, hurt by every stone and thorn. He could not travel far, he could not do much hunting, without a shoe. The woman made him boots and shoes of leather. A wise man who has written a book about woman's work in those primitive times says that the woman who first invented shoes should have a statue beside that of Watt, the man who discovered the use of steam.

How did the primitive woman cut the tough leather, without any scissors, without a steel knife? Go into the kitchen some day when your mother or the cook is making hash. If she has no meat cutter, she will put the bits of meat in a wooden bowl, and chop them with a chopping knife. Take a good look at this chopping knife. It is a broad, curved blade of steel in a wooden handle. Exactly such a knife as that, made of stone or ivory, the primitive woman used to skin the animals, to scrape the hide, and to cut out her leather garments, as well as to chop off the pieces of meat for cooking. Is it not strange to find

civilized woman using just such a knife in her kitchen thousands of years later? The only man who uses such a knife to-day is the saddler, who uses it to cut leather.

The Esquimau covers his boat with leather made from the hide of seals, prepared by the women, as we have seen. If he did not have this leather, he could not have a boat, for no wood grows in his country. The first ferry-boats over the Mississippi were boats covered with buffalo hide, and these boats, as early travellers tell it, were made and used by the Indian women to ferry people across.

Woman was the first rope maker. With her stone knife she cut the rawhide into long strips, immensely useful to people who had no ropes and no nails to fasten things together.

All this was very well in cold countries. But what about the countries that were too warm for fur and leather?

There the woman became a weaver. She took wild reeds and grasses, or the dried fibres of plants, and made cloth of them. She wove them in and out, under and over, and made a sort of matting,

or grass cloth. The native women of the Philippines make a grassy cloth as delicate as silk lace. In the National Museum at Washington there is a piece of primitive cloth ten feet wide and forty feet long. It is made of the tender, delicate fibres found inside the bark of certain trees. Primitive woman made yarn of wool, twisting the ends of the strands together to make a long cord. Then she wove this yarn into blankets or into cloth. For her weaving, woman invented the loom. The Navajo woman in Arizona weaves beautiful blankets to-day by this simple loom. Before our Revolution, and for some time after, American women wove almost all the cloth used in this country. Probably the grandmother of some child who is reading this wove the cloth for all her sheets and blankets. When steam was discovered, it was found that the woman's loom and spinning wheel could be put in the factory and run by steam, and that thousands of yards could be woven in the time she would take to weave one.

It is very necessary in our life to have receptacles, things that will hold other things.

The world is full of boxes, barrels, paper bags, cotton sacks. The dry goods store is full of paper boxes. The grocery is full of wooden boxes. The warehouses are full of barrels. Our homes are full of drawers, cupboards, closets, jars and boxes for holding things. We cannot get along without thousands of things that will hold other things.

Primitive man had none of these receptacles. He had no lumber, no boards. He had no nails to fasten pieces of wood together, no tools to work the wood with. He had not conquered nature enough to make her provide him with such things. He had not yet become a carpenter.

The primitive woman felt a terrible need for a receptacle of some kind. How was she to bring water from the spring without a pail or bucket? If she poured her acorns in a heap on the ground, they would soon be wasted and destroyed.

So she invented the basket, the first receptacle. She wove her baskets of grass or reeds or strips of bark or the young tender shoots of plants. Some were small and dainty, some as big as

barrels. Some of them she wove very close and thick and firm, and covered them with gum so that they would hold water. These were her water buckets; and she even boiled food in these over the coals, or dropped coals inside of them to roast the piñon nuts. They were made so well that she could use them in this way. For thousands of years primitive woman made baskets, and numbers of these baskets are preserved in museums. Some are very beautiful.

It has been said that woman was the first animal that picked up an object, put it inside another object, and carried it from one place to another. One of the greatest helps in the conquest of nature has been the use of pack animals. For long centuries man packed his goods on the back of the horse, donkey, camel, elephant, or some other animal, and carried them over the earth in that way. It was thousands of years before he learned to make a wagon. The railroad has now taken the place of the wagon and the pack animals. Our civilization could not exist as it now is without the railroad. We could not bring food enough to feed our cities,

or coal enough to keep them warm, if it all had to be brought in wagons or on the backs of animals.

But long before the railroad, before the wagon, before man had tamed the domestic animals and made them carry his burdens, woman was the first pack animal. Among savage tribes women carry all the loads upon their backs. Often among our Indian tribes the man would not bring in the animal he had killed. He left it where it fell and sent the women out to bring it in.

Primitive woman made the basket, she gathered her wild harvest of nuts, fruits or grains in it, and then carried it home upon her back or head. Even to-day Italian peasant women carry great baskets of vegetables or grapes upon their heads. And in every German city you can see working women with packs upon their backs.

Woman invented the first cooking pot; and there was no boiled meat, no boiled vegetable food in the world until she invented that stone pot. She found that a stone with a hollow in it could be filled with water, placed over the fire, and used to boil food. Then she could have soups and stews, as well as roasts. She next found that

she could hollow out one stone with another, and so make her cook-pot. She learned in time to hollow out the under side so as to leave feet for the pot to stand on. There was only one stone that the woman could use for this. All others would break in pieces if used with fire and water. The one was soapstone, and the wild woman of the forests discovered this, and wherever she went searched out the soapstone for her cooking pots. The stone cooking pot was made by all Indian women, and many such pots are preserved in our museums.

Woman was the first potter. She invented dishes. She found that she could mold certain clays into bowls and cups, dry them in the sun, and that they would keep their shapes. Sometimes she made these dishes in very quaint and graceful shapes, and ornamented them with pretty designs painted in colors which she had gotten from the plants. Pieces of this primitive pottery may be found in the American Museum in New York, the National Museum in Washington and other museums. The writer has sat beside a Pueblo Indian woman in New Mexico

and seen her make a clay bowl, just as her mothers did thousands of years ago. And in far-off Nova Scotia, thousands of miles from New Mexico, the writer has sat beside another Indian woman and watched her weave a basket of sweet-grass. Yet once such dishes and baskets and cook-pots made by these forest folk were, with a few other things, the only manufactured goods in the world. How many thousands of years did man have to lie down flat upon his face and put his mouth in the spring or river to drink, like the other animals, before the race learned to make a dish to drink from!

The primitive woman, who did so many kinds of work and invented so many things to help her in her work, was quite a wonderful woman in her way. About 1770 an Englishman, named Hearne, made an exploring expedition in Canada, and wrote a book about it. One day his party saw the track of a strange snowshoe on the snow. They followed the track and came upon a young Indian woman, all alone. The Indians of his party talked with her, and found she had been captured and carried off by a hostile tribe.

Watching her chance, she ran away, and tried to make her way back to her own home. But she lost her way, and now had been seven months in the wilderness without seeing a human being. She had no gun, no weapon of any kind; but she had made snares and had snared all the rabbits and partridges she could eat. From the rabbit skins she had made herself a neat warm suit of clothes, and had even put trimming on them. She had made herself a hut to live in, and she had a fire. She did not make her fire with two pieces of wood, but by striking two stones of a certain kind together, and so getting a spark. She had gathered stuff for kindling, and after a long time the spark had caught in this and started her fire. It was so hard for her to get the fire, that she had never let it go out.

She had brought with her, as weapons for this long journey in the wilderness, four or five inches of iron hoop, and a piece of an iron arrowhead, probably all she could get hold of. With these two things for tools, she made herself snowshoes. On these she roamed over the snows and watched her snares. Her spare time she occupied in pre-

paring twine of the inner bark of willows to make a fish-net for use in the spring. When the party found her she had six hundred feet of the twine. She was in good health and quite ready to start on the long march to her home.

Any civilized woman or man, taken from one of our cities and placed in the forest without anything more than this Indian girl had, would die miserably of cold and hunger. That is no shame to them, because we do not live by trapping, and there is no reason why we should know how to do it. But every one should be able to provide for his own living in the life in which he has been brought up. If he cannot, he is not the equal of this Indian woman.

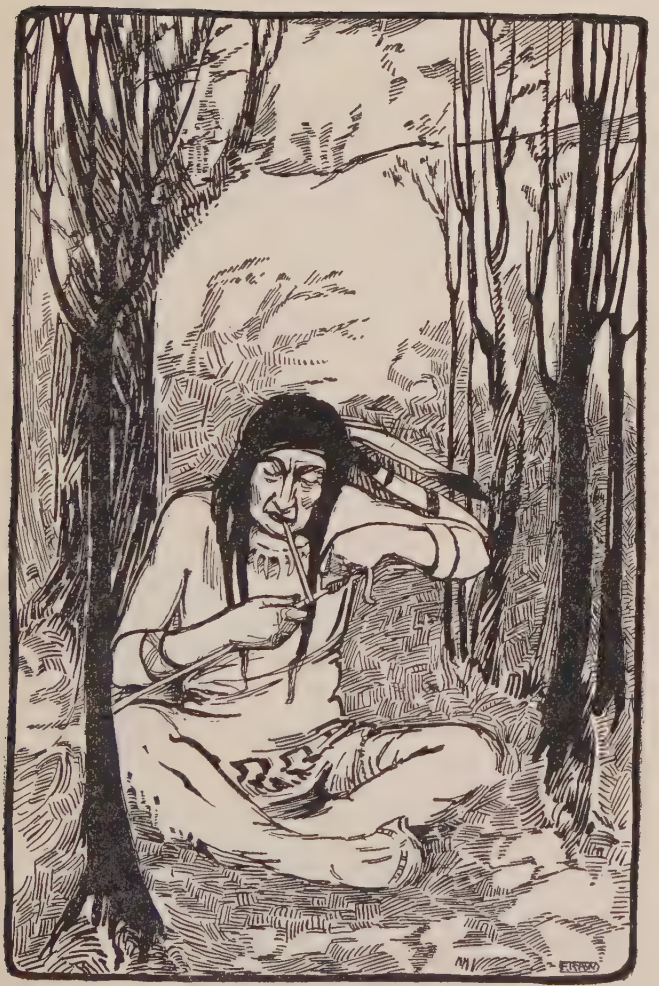
People invent or discover things that help them with their work. As they toil painfully over their labor, they see ways to do their work more easily and quickly. We have seen that the woman was the first pack animal, the first harvester and food storer, the first farmer and manufacturer, and that she invented and discovered things that would help her in all these different lines of work.

What was man doing all this time? Man was

a hunter, fisher and warrior during all these early days of the race.

Hunting, fishing and going to war form so small a part of our life to-day that it seems as if primitive man did very little, and was a rather idle fellow. But life was very different then. Man is a meat-eating animal. Think of the amount of meat in all the butcher shops in the world. Think of the thousands of pounds of meat that it takes for just one meal of the people in one city. Think of the great trains loaded with cattle that speed in from the western plains to feed the people in the East. Think of the sheep, the pigs, the poultry, produced in this country. In the first days of the race there was no supply like this. Man had as yet no domestic animals or poultry. If he wanted meat, he had to go out in the woods and kill a wild animal, and to kill it without a gun or a knife. This was a work which took a great deal of time, strength and skill. Often he spent long hours and days on the hunt, only to come home empty handed.

Man grew very ingenious in ways to catch and kill game and fish. We have seen his first inven-



Busy inventing Things to kill With. (37)

tion, a wooden spear. For a long time man invented only devices for killing, — traps and nets, to catch fish and animals, and weapons of all sorts. He had been inventing and perfecting a long time before he could make so fine and dangerous a weapon as the bow and arrow. Up to the fourteenth century, when gunpowder came into use, white men fought all their wars with bows and arrows. From the earliest day to the latest man has been busy inventing things to kill with. There is no record of woman inventing any weapon.

Man also invented boats for his fishing. He saw logs floating down the river. He saw that he could ride on these logs. He saw that he could tie logs together and make a raft that would carry a load on the water. He saw that he could help this raft along by shoving with a pole. From here he went on to the invention of boats, oars and paddles until finally he was able to make the beautiful birch-bark canoe of the North American Indian, probably the prettiest boat ever made.

With all his hunting, the wild man was not able

to keep down the number of wild animals very much. It took gunpowder to do that, as the history of the buffalo shows. When white men first pushed beyond the Mississippi they found the plains covered with great herds of the American bison, called buffalo. These herds were so vast that it took hours for one to pass a given point, and far as the eye could see, the plain would be covered, as by a rolling black sea, with the heaving backs of these great beasts.

And yet the Indians had always hunted the buffalo. They got from it not only meat, but clothing, ropes and tent covers. The annual buffalo hunt became so important a part of their lives that they made it part of their religion also. Only a few years ago the present writer saw the Pueblo Indians of New Mexico dancing the Buffalo Dance. This dance, held just before they went on the buffalo hunt, was once a sort of prayer for good luck in the hunting. The buffalo are gone, but the Indians still retain the old dance.

But though for countless years the Indians had hunted the buffalo, these vast herds survived.

It took the white man, coming by thousands on his railroads with his deadly rifle, to exterminate this animal. As late as the 70's herds still roamed the plains. A few years later they were gone forever, dead by the guns of the white man.

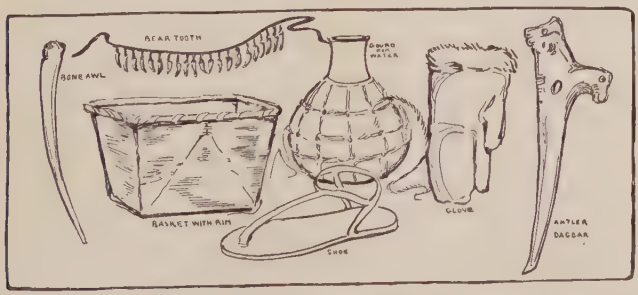
We cannot now realize the terror with which man, up to a very late period, regarded the wild animal.

As with the hunt, so with war. Primitive man was always at war. Since our government was established over one hundred years ago, we have had very few wars, and most of these were of brief duration and took only a small number of men to the battlefield. Our vast country stretches three thousand miles from the Atlantic to the Pacific, and all the states live at peace together; and we live at peace with Canada, our great neighbor on the north.

But in the early stages of its history the human race dwelt in small, isolated groups called tribes. Because they did not yet know how to produce their own food, it took a large area of wild land to support each tribe. This land was called the hunting-ground. If it was good hunting-ground,

men of other tribes would try to come in and steal it. Then there would be fighting. Or perhaps men of the tribe would go out to steal the hunting-grounds of other tribes. So there was constant fighting about the land.

There was another cause for tribal wars. Primitive man did not labor. He never did what we call work. He only hunted and fought. But the women worked very hard. They were very useful to the men, providing them with many comforts. So the men liked to capture women of other tribes and make them work as slaves.



To steal women for slaves was a frequent cause of tribal wars. Sometimes men of other tribes were enslaved. One of the first things man tried to do on this earth was to force other people to

work for him for nothing. And as women were the first workers, they were the first slaves.

So we see that the men were very busy in these early days with fighting and hunting. And they invented and made things that would help them in their occupations, just as women did.

CHAPTER III

The Beast-tamer and His Helpers

IT was a great step in the conquest of nature when man learned to tame wild animals. At first this was not done that they might be of use to him. It happened by chance, or because the little wild cubs or kittens made playthings for the children.

The dog was the first animal domesticated. The first dogs came from jackals. Jackals are animals that sneak after larger animals and eat the remains of carcasses left from their kill. So when man went hunting, the jackal would slink about to feed on any refuse which he left. For the same reason, it would hang around the man's hut to feed on refuse. In this way, the children probably got hold of little jackal cubs and raised them as pets. These pet jackals, when grown, would follow the hunter in his hunts, and after a

THE WILD CUBS MADE PLAYTHINGS FOR THE CHILDREN.

while he saw that they could help him in the hunting, and began to train them to do this.

So man got his first animal helper, the hunting dog. He had conquered nature enough to bring one animal out of the woods to the fire. All wild animals are afraid of the fire. But the dog has lost this fear. He loves the fire, and likes to make his bed near it.

Because the dog has lived so long with man, he is the most thoroughly domesticated of all animals. He knows the human voice, the human face, human language and feeling, better than any other animal, and he is almost the only animal that shows a warm personal affection for man.

A little later the woman tamed the cat. You will remember how the woman stored corn and grain. Just as soon as she began to do this, the rats and mice hung around her granaries to eat her grain. Then she noticed that the wildcats were hanging around the granary, too, to catch the rats and mice. Some kittens of the wildcat were raised as pets, like the cubs of the jackal. The woman fed them and kept them about so

that they could protect her grain from the mice. And so the wildcat became the domestic cat, our house pussy.

It is not likely that wildcats such as we know were domesticated. The smallest of them would be too large and dangerous a cat to have about the house. Pussy must have had ancestors of her own in the forest. She must have come from some family of small wildcats, which has now disappeared, destroyed, perhaps, by the larger and fiercer beasts. In Egypt there are many stone tombs and buildings with pictures and writing on them. People have learned to read this writing, and from it have learned a great deal about the ancient Egyptians, a great and powerful people thousands of years ago. They have found that these ancient Egyptians worshipped one goddess who, they thought, could see in the night. The cat, which can see in the night, was sacred to this goddess. And because the cat was sacred it was never killed in Egypt. When it died, its body was carefully embalmed, like those of human beings. The ancient Egyptians knew how to preserve the

bodies of the dead very wonderfully, so that these bodies have lasted all this time. These embalmed bodies are called mummies. And to-day in the tombs of Egypt are found thousands of mummies of cats.

You see the cat was very useful and important to the Egyptians; so useful and important that it became a part of their religion. Egypt was a great grain-growing country, and the cat was precious because it protected the grain. And just as the Romans put the woman and the fire together in their religion, because women were the first guardians of the fire, so the Egyptians put the woman and the cat together in their religion, because it was the woman and the cat together who first guarded the grain.

The cat has been held very valuable in countries where there were few of its kind, so valuable that laws have sometimes been made for its protection. In the year 938, more than nine hundred years ago, a very curious law was made in Wales, a little country which is now part of England, for the protection of pussy. This law first fixed the price for all cats, beginning with

the price to be paid for a kitten before it got its eyes open. Next it fixed the punishment for anyone who stole or killed the cat that guarded the granary of the prince. This thief, if discovered, was to pay over a sheep and a lamb. Or he was to pay over an amount of wheat which was decided in the following way: The cat was to be hung up by its tail, its nose touching the floor, and the thief should pay wheat enough to cover the cat to the very tip of its tail.

This is a funny law, and shows that cats were scarce in the British Isles then, and were very much valued to protect the grain. It shows, too, that pussy came from some family of her own in some far distant country, for at that time the woods of England and Wales were full of wildcats, which were quite different from the house cat.

In the days when people believed in witches, they always thought of a witch as an old woman with a cat, which shows how the cat had attached itself to the woman, so that people thought of them together. And to this day the dog is oftenest the boy's pet, while the cat is the girl's.

The wild horse lived in portions of the world

where it could find great plains of rich grass to feed upon. Man tamed it to help him in his hunting, and has taken it all over the world with him. Woman probably tamed the milk-giving animals, the cow and goat, to give milk for her children. The sheep probably came later, and was used first for food, and afterwards for its wool. Later, people learned to spin the wool into yarn, and weave the yarn into cloth.

The domestication of these animals, raising them in captivity, was a great step in man's conquest of nature. It may seem to you, thinking of the vast quantities of meat which we consume, that these animals were first kept for food. But there is no doubt that man first kept them to do his work. Man could not progress very far until he found something to help him with his work. He could not conquer nature without help. He never has. As time went on, he found more and more powerful helpers. His first good helpers were the animals.

Man is the only animal that has property. He had to have property from the very first. He could get not a mouthful of meat food without

a club or a spear, or a net or trap of some kind. This club, spear, net or trap was property, and he had to carry it around with him. After all the trouble of making, he did not want to throw away his property and make more at the new place. Clothes are property. Every tool and implement, every bit of stored food, was property. The poles and skins that made his tent were property; the heavy stone cooking pots. These things must all be moved whenever the family moved, or else made again by long, slow hand labor. There were no stores in which new articles could be bought. There was no money to buy with. There was no commerce or business or trade. There were only families or little groups of people, making everything they used themselves. These people could not move from place to place very much. Without something to carry their property, they could scarcely travel at all. Man's great need was for something to transport his goods, — a pack animal.

In every part of the earth man has tamed and trained some animal to do this. The horse seems to have been first tamed in eastern Europe or

western Asia. It is the noblest and most intelligent of all man's pack animals, and he has taken it around the globe with him. But it cannot live, like the dog, in the polar snows, and it does not do well in the hot countries around the equator. It is an animal of the temperate zones, and with it man has conquered the temperate zones. As a pack animal, a riding animal, or for hauling, it has become the inseparable companion of man. In the United States and the British Isles it is much used for ploughing and other farm work. Together with man the horse first broke the sod of America, hauled the timber from its giant forests, and transformed this vast wilderness into fertile farming land.

But very few countries use the horse for farm work. In France and other European countries the ox is used for ploughing, and this is true wherever ploughing is done in Asia. The ancient Egyptians, the Hebrews in Bible times, and all other very early nations used the ox to plough. The domestic oxen were tamed from the wild oxen found in various parts of the world. In Europe this wild ox was called the aurochs. It

is no longer found in Europe. It has been exterminated, as the buffalo was exterminated in America. The wild ox used in India has a hump on its back, and its domestication goes back to far distant times.

Another animal of the horse kind was the wild ass. In his wild state the ass was nearly as swift as the horse. But in captivity he has not been bred for speed, as the horse has, and he has become a very slow and patient animal. Man tamed him early for a pack animal. We despise the ass in this country, because this is a young, rich and fertile country, and we can use the larger and more expensive horse. But the ass can live on pasturage so poor that a horse would die on it. So in the countries around the Mediterranean, where the grass is poor and scanty, and the people are poor and not able to support the large and costly horse, the ass is used very largely for farming, riding and hauling. In Sicily you may even see building stone, for building a house, carried on the backs of little asses which seem hardly larger than a St. Bernard dog. In haying time, instead of loading a great hay wagon as we do, the Sicilian

farmers will send the hay to the barn tied in great bundles on the backs of donkeys. The little animal, excepting for his tail and ears, is quite hidden from sight under his load. It looks as if a load of hay were walking off by itself, with just a tail and a pair of ears to keep it company.

The ass has one great advantage over the horse. He is more sure footed, and can climb safely over rough trails where the horse cannot go without danger. So he is used a great deal in mountain travel. In our own Rocky Mountains to-day, one may sometimes see long lines of little burros, as the ass is called there, winding their way up some steep mountain side, each loaded with food and supplies of all kinds, carefully strapped on in a great pack. They are going to some mine far back among the hills a long way from the railroad. It is a very pretty and interesting sight. There are still countries where men have no other way to travel or carry their property.

In some parts of the Himalaya Mountains in Asia, and the Andes in South America, sheep and goats are used in the same way for transportation over the mountains. In pictures and stories

of the search for the North Pole you have seen that the dog was the only animal that could go with man far, far into the regions of eternal snow, dragging the sledges across the fearful ice floes where no horse could live. The rich mines of Alaska have been opened up by the long trains of Esquimau dogs, called "huskies," which are the only animals that can drag sledges over the winter snows of that country. Dogs carry people, supplies and the mails in Alaska. In the cities of Belgium and Germany to-day you may see milk carts drawn by dogs. So you see that when man no longer went hunting for his food he turned the dog into a pack animal.

One other animal has been used for transport in the Arctic regions. In the farthest north of Europe the reindeer makes life possible for the Laplander. Harnessed to sledges, he can haul great loads swiftly for a great distance over the snows, and his body furnishes both meat and clothing for his master.

Coming down from the cold countries into the regions of eternal heat, we find an animal perfectly adapted to travel over burning, rainless

deserts. Across the Sahara desert in Africa, and the deserts of Asia, still go long lines of camels, called caravans. Camels have water sacs in their stomachs. When they drink they fill these water sacs, and this water supplies them for a long time. So they can carry man's goods in countries where there is no water, and where any other animal would die. The camel trains still transport merchandise, as they have for thousands of years in countries where no railroad yet runs, and where no ox, horse or other pack animal could live.

The government of the United States once spent $30,000 to import camels, with the idea of using them in Arizona and other hot, dry parts of our Southwest. This experiment was not successful. There is a story that one camel escaped, and for years was seen from time to time wandering alone in the wilds, like a lonesome ghost.

Some animals have strength and intelligence, and could be very useful to man, but they will not breed in captivity. The elephant is the strongest and probably the most intelligent of

all beasts. In some parts of Asia elephants may be seen doing wonderful work, carrying enormous timbers in their trunks, loading, unloading and piling them neatly, all at a word or touch of one poor little half-clothed miserable native, whom the elephant could crush like a peanut shell. But almost all these elephants had to be captured in the forest. Very few are born in captivity. So the elephant is not truly a domestic animal.

In Siam, a country of southeastern Asia, the entire transportation of the country, away from the rivers, is done by elephants. All the work and the carrying done in this country by horses, railroads and automobiles is done there by elephants. All these elephants are caught in the forest, and the great elephant "round-up," each year, is one of the most wonderful sights in the world. The natives make a great line for miles through the forest, beating drums and building fires, and the elephants, not understanding the fire and the noise, are slowly driven inside a fence. This fence is made of logs so strong that even the elephants cannot tear it down.

Men ride in on tame elephants, and rope and tie the wild ones so that they cannot get away. The tame elephants help to trap and capture the wild ones. They have turned traitor to their own kind, and are as cunning as men in leading their wild brothers into slavery. The elephants, when they are trapped and conquered and know they cannot escape, will cry piteously. Great tears roll down from their eyes.

So in every part of the world man has found some animal which he could tame and teach to work for him. He could not have conquered very much of nature without the beasts of burden, because the work is too hard for man alone. One of man's greatest conquests of nature was when he coaxed the domestic animals away from nature and brought them from the woods to be his servants and helpers. One reason why some tribes of men have advanced so much farther and faster than others was because they found in the countries where they lived suitable animals for helpers. The American Indians would doubtless have progressed much further than they did before the white man came, had they had the horse.

But there were no horses in America till the white man brought them here from Europe, and the Indians had no way of getting about except on foot or by boat. Our western plains are peculiarly adapted to horses, which flourish and do well there. Most of the horses used in this country come from the West. It is a natural home for the horse, but nature had neglected to place any horse there, and the Indian had no way of getting over that vast, treeless, riverless section except on foot. So of course he could not conquer it. He could not settle there or build cities or villages, or become civilized.

In South America the white man found that the native tribes had domesticated one animal which was very valuable for meat, for wool, for milk, and as a pack animal. This is the llama, a kind of goat that can travel over mountains so rough no other animal can climb them. In the very region where white men found the llama domesticated, they found a rich, civilized country, full of gold and silver, Peru. The ancient Peruvians could not have worked their gold and silver mines without the llama to transport their

goods. And the silver mines to-day in that country could not be worked without the llama, for where no other animal could travel it will carry supplies up to the mines and bring back loads of ore.

We do not eat horse meat, not only because custom and feeling forbid it, but largely because the horse is of more value to us for work than for food. It is too expensive to eat. So at first the oxen and all the other animals were doubtless too valuable to eat. We have seen in various places how man put whatever was very valuable to him into his religion: the sacred fire in Rome, the cat that guarded the grain in Egypt. In one of the religions of India the cow is sacred, and is not killed. This feeling undoubtedly descends from the early days of the race, when the wild cattle had just been tamed and found to be the most valuable of all animals, yielding both milk and labor. In that day domestic cattle were too valuable to be killed for food, and so man in that region made them sacred.

But in certain parts of the world it was found that these valuable beasts could be raised in large numbers. This was in tracts of country where

there were not many people, and where there were great stretches of wild, treeless land, covered with grass that made a natural pasturage for the herds. There great herds of cattle and flocks of sheep could be raised, and in those regions men left off hunting and became shepherds. This was one of the earliest occupations of mankind. You remember that in the story of the birth of Jesus it was "shepherds, watching their flocks by night" who saw the star and followed it. Men found that instead of getting their meat by the long, hard, uncertain way of hunting the wild animal, they could produce vast quantities of it easily and safely. And just as in the hunting days men quarrelled and fought over the hunting-grounds, so later they warred over the pasture lands for the flocks. Even to-day the "cattle men" and "sheep men" sometimes fight and kill each other in our western country. Cattle hate the smell of sheep so much that they will not feed where sheep have been. So when the sheep men bring in the flocks of sheep, the cattle must go. And there have been feuds and murders over this in the range country of our far West.

This ancient occupation of man, herding, is still practised in new countries, where there are vast stretches of natural pasturage, unoccupied by man. The great cattle countries to-day are in North and South America, and the great sheep countries are Australia and New Zealand, all new countries, which have not been settled by white men very long. We have seen how mighty herds of wild buffalo lived on our western plains. When the buffalo were killed off, it was found that great herds of cattle would do just as well there as the buffalo had. Many stories have been written of the cowboys, who are such splendid riders, and of their wild adventures as they rode after the cattle on their wicked little western horses, called broncos.

But soon that wild and picturesque chapter of American life will end forever. To raise cattle in this way it is necessary to have vast stretches of wild land, with no fences. As the farmers move in and fence off their farms, the "range," as the wild land is called, grows smaller and smaller. Soon there will be no range left, and the cattle will be found only in small bunches on

the farms, as they are found in our eastern states and in Europe. Just as man can get more value from the land by herding than by hunting, so he can get more by farming than by herding. The herds must go, and the farms come in.

It is easy to see why this is so. It is much easier and cheaper to raise a great field of wheat than to raise a herd of cattle. And man can eat the wheat, when made into flour, as well as he can beef. As population grows greater, and there are more and more people to feed, more and more of them must eat the flour and fewer the beef. In Italy, and especially in Sicily, old and poor countries, there are thousands of people who never taste meat. The staple foods of the country are bread and macaroni, which is made of wheat flour, like bread. In Sicily one rarely sees a cow. Nearly all the milk used comes from the goat, which is a smaller and less expensive animal than the cow. But there are great fields of golden wheat, ripening to make macaroni flour.

On the farms of the United States large crops are raised only to feed animals. Great fields of corn are grown to feed pigs. It is much more

costly to raise corn, feed it to pigs, and then eat the pigs, than it is to eat the corn itself. It is likely that as time goes on we shall eat less pork and more of the corn itself in some form.

This change in our food has already begun. Just a few years ago all the meat shops in our cities did a brisk trade in the early morning, when the housewives came in to buy meat for breakfast. But that "breakfast trade," as the butchers called it, is all gone now. Very few people eat meat for breakfast. Few people are eating meat more than once a day. Thousands do not eat it once a week. All old countries have come down to some one vegetable food, which feeds the great mass of the people in that country. In China, Japan and India, this is rice; in Scotland, it is oatmeal; in Ireland, potatoes. Americans have always been a meat-eating people. Perhaps the day will come when the masses of the people here eat one form of vegetable food, and taste meat as seldom as the poorer classes in China, Japan and Italy.

The pig, tamed from the wild hog, is the only animal domesticated for food alone. It

does not give milk, clothing or labor to man. The pig is not a grazing animal. It does not require fields to range over. It can be kept in a pen and will eat any sort of refuse,—food that no other animal would touch. It has always been a favorite animal with poor people, who had only a little land, and can have a little meat food from the one pig they raise. So the pig is kept in all old countries. It is greatly prized in China, where the country is old and poor, and the population very great. It has been said that among the Irish peasants the "pig is the gentleman that pays the rent." On their little plot of land the cottagers will raise potatoes enough to feed themselves and the pig, and the pig is sold to pay the rent to the landlord who owns the land. And this is just as true in little villages in the south of England as it is in Ireland.

When the primitive woman was ranging the woods to find food for her family, she found that the eggs of birds were good to eat. After a while she took some of the little birds home, kept them as pets, and tamed them. The most important, and probably the first bird to be tamed, was the hen.

The hen was once a wild bird like the quail or partridge. To-day on most farms, the hen lives a half-wild life. She loves to hide her nest where no one can find it, and stays around the farm buildings only because she finds food there. That woman in the forest who first tamed a wild bird for its eggs never dreamed that the humble hen would some day be one of the most valuable possessions of mankind. Millions of dollars are paid in the United States every year for eggs and poultry. And as the country grows older, and beef and mutton become more and more expensive, the demand for eggs and poultry will grow greater and greater. The hen, too, is a favorite in old countries. In China almost the only meat known is pork and chicken. The hen is a far less expensive creature to raise than the cow, sheep or pig, and yet eggs and chicken are just as good food as beef, pork or mutton. The United States raises seven hundred million dollars' worth of eggs and poultry a year.

Another business based on animal culture is the dairy industry. In this cows are raised not for beef, but for milk, butter and cheese. Thou-

sands of men are employed in caring for and milking cows and transporting the milk to consumers. Other thousands are making the milk into butter and cheese in creameries.

Thus we see how large a part of our living, how much food, what great industries, giving employment to millions, come from these few domestic animals that man lured out of the wild and tamed thousands of years ago. Man made a great step in the conquest of nature when he tamed the few domestic animals that have gone with him round the world.

But this is not half of what these animals have done for him. It was the domestic animals that made both agriculture and commerce possible. Without the plough, drawn by the ox, horse or some other animal, man could have done no farming on a scale large enough to feed large numbers of people. The spade in the hands of man was not a powerful enough tool to break up the tough sod. He could not drive it in deep enough to cultivate the earth, and his labor was slow. Man could cultivate only a little piece of earth when he himself must spade it all. It was one of the great

steps of the conquest when man discovered that he could make a tool of such a shape that, held firmly in the ground and pulled by a horse or ox, it would tear open a long, deep furrow in the soil. The man who discovered that started farming.

The plough was first made of wood, and in Oriental countries wooden ploughs are still used. In Spain you may see men to-day ploughing with the root of a tree, which they have hacked into something shaped like a plough. And probably the root of a tree was the first plough. After iron came into use, they made the plough of iron, and so had a much more powerful tool. To-day they plough the vast wheat fields of our western states with a machine plough run by electricity.

Why did man give up hunting and take to herding and then to farming? Because he saw that it was more profitable. Perhaps as time went on, and as he killed them off, the wild animals grew more scarce. Then, when he no longer had to hunt for safety, he saw that the woman's way of raising things was wiser than his way of killing things. He saw that he could get more food, and get it more easily and quickly, by raising plants and

animals than by his old way of hunting. When man stopped giving all his time to hunting and fighting, and began to give some of it to work that *produced* things instead of killed things, the world began to get along a good deal faster. People became more comfortable. They had more to eat and to wear and to use. The work of all the cooking, all the care of the children and the home, all the raising and harvesting of the crops, all the manufacture of everything used except the man's weapons, was too much for the woman alone. She could not carry any of it very far, and she was a slave, bowed down under her load of labor. When man took over the raising of the crops and some other kinds of productive work, the human race began to improve very much.

The first stage of man's existence is called the *collecting stage.* The woman collected the wild fruits, nuts, grains and grasses and also began to cultivate some of these in little patches. The man collected the meat from the streams and forests.

One example of the pure collecting stage still exists among the Esquimaux. The Esquimau

cannot raise anything in the Arctic region where he lives. He lives entirely on what he catches and kills. The polar bear, seal and walrus furnish him with food, fat for light and fire, furs for clothing and bones and ivory for utensils. Nowadays the whaling vessels help out the Esquimau with a few steel tools and some other comforts of life. But this only makes his life a little easier. It does not change its nature. Among the Esquimaux to-day the women may be found carrying on those industries which all women did in the beginning of the race. They skin the animal, curing the hide into fur or leather. They make the clothes and boots. They cover the boats with sealskin. They make the lamps and cooking pots of soapstone. They make bowls and saucers, though they never saw a bowl or saucer from a civilized country. They make their own thread and needles, and everything else that they use in their work.

The collecting stage of mankind was a very wasteful and uncomfortable form of existence, and its methods supported a very small popula-

tion. Let us return to the Tasmanians for an example. We found them burning out little fields in the forest, so that kangaroos would come there to eat and so be killed easily. Not many years ago, when white men first reached Tasmania, they found fewer than 3000 natives in the island. Tasmania has an area of more than 26,000 square miles, so that it took nine square miles, or six thousand acres of land, to support each native.

Tasmania has still a very scanty population, for it is a new country. But it now supports 200,000 white people, who live on the same land with greater comfort than the 3000 did before. This is because the white man, instead of merely killing kangaroos and sea-birds, took out his sheep and fruit trees and raised mutton, wool and fruit.

Sometimes you will find people talking or writing as if a great injustice had been done the American Indian in taking his land away from him. The American Indian was the most interesting savage that ever lived. No man ever fought more bravely or well to keep his country. His warriors were the equal of those of any race.

Some of his chiefs, statesmen and orators were the equals of any in civilized nations. Probably he has many times been treated badly by the whites.

But this vast United States, when the white men came, supported probably not more than 250,000 people. It supports now nearly one hundred millions. That alone is reason enough for taking his country away from the Indian. In thousands of years upon this continent the American Indian had never built a road, never tamed a domestic animal but the dog, never made a plough, a wagon or a sailboat. It was right that people who had done these things should take the land and make it support greater numbers than he ever could. And every race that fails as he did will be ousted from its land by the white man, who will take over the country and make it support a larger population.

Why is it that the collecting stage supports such small populations? It is because the life is so hard, and the food supply is so small and uncertain, the term of life very short and the death-rate very heavy. People starve to death

and freeze to death in winter, because they do not know how to keep themselves fed and warm. Many babies die, and many of the young. It is not from laziness that failure comes. The man who follows the deer all day works as hard as the man who follows the plough all day. But at the end of the day he has perhaps one deer, perhaps nothing at all, while the ploughman has ploughed land which will raise potatoes enough to feed a family for a year. Again, the man who follows the plough all day on foot works harder than the man who sits comfortably on an electric plough and drives it all day. But the electric ploughman has ploughed land that will raise wheat enough to feed hundreds of families for a year. It is not work so much as brains that conquers nature.

We see that the domestic animals by dragging the plough made agriculture on a larger scale possible.

And domestic animals, by carrying merchandise on their backs, made commerce possible. Commerce has been one of the greatest forces of civilization.

What is commerce? Let us suppose that a

Domestic Animals made Commerce Possible. (73)

little tribe of primitive people lives on the shore of a salt lake, and learns to make salt very well. Salt is something that all people want. Probably all the tribes and villages through a large extent of country use salt. For them to go to the lake on foot and bring back a little salt on their backs would be a long and toilsome journey. But if the salt makers have horses, or some other pack animal, they can take long processions of them, loaded with salt, to the villages back from the lake and bring them home loaded with things which the other tribes have given in exchange for the salt. The salt makers have more salt than they need. The inland tribes have not enough. By exchanging the salt for anything that the other tribes grow, or make, both are benefited. There is an increase of comfort and of wealth. Perhaps the salt makers need not do other work. They can give all their time to making salt, which they know how to make easily and well. In exchange for the salt, the other tribes will be glad to give food and clothing.

All commerce began in simple ways like this. And it could begin because there were pack ani-

mals to carry loads of these products. The work was too slow and too hard for man to do.

After man had tamed the pack animals, and found that he could make them carry loads of things he did not need or want in exchange for other things which he did need and want very much, he was eager to do this, and commerce grew very fast.

Tea, for instance, is the leaf of a plant that grows in China and Japan. Coffee is the berry of a bush that grows in parts of Asia and South America. Sugar comes from sugar cane, a reed that grows in Louisiana, the Hawaiian Islands, and other parts of the world. It is also made from the root of the sugar beet, which grows in Europe and our western states. Almost everybody in the world uses sugar; almost everybody uses tea or coffee, or both. The people who raise tea, coffee and sugar need not engage in any other business. Other people will give them necessities in exchange for the tea, sugar, and coffee they raise.

It is the same with commerce in cinnamon, nutmeg, ginger, mustard, allspice, cloves and other spices, which are used for cooking in every

house. These grow only in hot countries, mostly in southeastern Asia. By commerce they are taken around the world to the people who want them. Almost every country produces something that other countries want and will pay for. The exchange of these products is commerce. The great ships that speed across the oceans, the long railroad trains that rush across the continents, are all packed with these products for exchange. The lumber of the forests is sent to the cities to build houses. The boots, shoes, cloth, dishes and furniture made in the factories are sent to the people who want to buy them. The oranges and lemons of Florida and California are taken to the northern states where they do not grow. The bananas of the West Indies are sold all over the United States. The coal of the mines is taken to the cities and factories. The wheat of the West is transported to the flour-mills. The cotton of the South is carried to the cotton mills of England and New England.

This vast system of commerce which now links the world began with little loads of goods on the backs of the humble pack animals.

One reason that certain parts of the world lag behind the rest to-day is because pack animals cannot be used in those parts. It is not among the Arctic snows, or on the wild mountain trails, where only the sure-footed llama can go, that there is no form of commerce. It is in the forests of the equator, where the tropical vegetation grows so dense that no animal can push its way through. Only man with an axe in his hand, cutting the giant vines and plants before him as he goes, can get through. In the heart of Africa the only way to transport supplies is on the backs of men; and men are the weakest, poorest and most expensive means of transportation known. Among the forests of the Amazon River, in South America, the only way to travel is on the river itself. Back from the river stretches a vast region of trees, plants, vines and shrubs so dense and thick that no pack animals can be driven through. No roads can be made because vegetation grows so fast that in a day or two after they are cleared the roads grow over again.

Commerce has been a great educator of mankind. In travelling from place to place to ex-

change goods men have learned a great deal about each other, and about the world, and about different ways of doing things. This made them much more intelligent. They came home and told what they had seen, and introduced new goods, new methods and new ideas. This added greatly to the general knowledge.

The discovery of America was largely due to commerce. The people of Europe loved the spices, pearls and silks of India. These rich goods were brought across the deserts of Asia on the backs of camels. At the Mediterranean coast they were loaded on boats, taken to the cities of Italy, and so scattered over Europe. This was a long, slow process, and it made these goods expensive. The people wanted more of them and wanted them cheaper. A great fortune awaited any one who would find a cheaper and quicker way to bring the costly goods from India.

Columbus, an Italian sailor, believed that the world was round. In his day, no one else believed this. Now it is not at all likely that Columbus would have travelled from king to king in Europe,

begging them to give him ships to go and prove that the world was round. People did not give money for such things. What he did ask for was money to find a shorter way to India, so that the spices, the silks, the perfumes, gold and pearls of the far East could be transported without that long, slow journey by caravan, that terrible journey across Asia in which men and beasts often perished miserably in the desert.

The people called Columbus crazy, and tapped their foreheads as he went by. But one monarch, a woman, believed in him. Queen Isabella of Spain gave him three ships. Columbus sailed away in these. Though he did not find a shorter route to India, he proved his theory and discovered America. We may say that this discovery came about through commerce.

One insect man has not been able to tame, though he has forced it to give him food. This is the honey-bee.

Man has taken hives of bees with him into all the new countries where he has gone. Before the railroads reached California, great efforts were made to get bees from the East. One man

named J. Gridley took four hives of bees on a wagon all the way from Michigan to California. Other men went east by sea, journeying six thousand miles, just to get bees. During the winter of 1859, six thousand hives of bees were taken from the eastern states to California. They were sent in ships all the way from New York down around Cape Horn, at the southern end of South America, and then up on the other side, a journey of months. Most of them died on the long voyage. The first honey in California sold for two dollars a pound, and the first swarms of bees sold for more than a hundred dollars apiece. In this land of flowers and fruit blossoms, bees have proved profitable. They have been worth millions of dollars to California.

About the same time that bees were being taken from the eastern states to California, eastern men were trying to import bees from Italy. The Italian bees were much better than the American, larger, more easily handled and better makers of honey. Men went to Italy and brought back hives, but the bees died on the voyage or after reaching America. Finally, in 1859, Mr.

S. B. Parsons of Flushing, Long Island, succeeded in getting alive a few swarms from Italy. They did well, and from them the Italian bee was introduced into America.

In ways like this the breeds of sheep, cattle and poultry have been introduced. When Americans first went into Texas and California they found vast herds of wild cattle there. Yet there was not a cow in America till the white man came. It is said that Columbus, on one of his later voyages, was himself the first man to bring cattle to America. The great herds found by the settlers had come from Spanish cattle that had escaped from the early Spanish settlers and run wild upon the plains.

In the same way, when people first went West from the eastern states, they found great herds of wild horses. Yet there was not a horse in America till the white man came. These herds descended from Spanish horses which had run away years before. As late as 1860 there were still herds of wild horses in Illinois, Indiana and other states in the Middle West. When the Americans entered California in 1849 they found the state overrun with wild horses.

One of the most useful things a man can do for his country is to introduce into it a new and useful plant or animal. Our histories are full of the names of great soldiers and fighters. Often these men have not done a thousandth part as much good as some unknown and forgotten man who introduced a new plant or domestic animal. We have a foolish way of making a great fuss over the *destroyers*, while we say little about the *producers*.

You see there are a great many interesting and romantic things about the domestic animals. Man has taken his domestic animals all over the world with him. But much to his disgust certain other animals that he did not want have attached themselves to him, and go wherever he goes. The rats and the mice have deserted the fields and forests where they belong and have come to live in his houses, his ships and his granaries. There they eat his food and destroy thousands of dollars' worth of grain in his storehouses. Man has exterminated the mighty buffalo. He has almost exterminated the huge whale, as big as a ship. He has killed off the

bears and wildcats so that they bother him no more. But the rats and the mice he has never been able to exterminate. They remain, and with them remain many other pests. Man has not wholly conquered nature. Every woman, boy, or girl who sets a mouse-trap, puts out a piece of fly-paper or dusts insect powder is helping to-day in the age-long effort man still makes toward the conquest of nature.

CHAPTER IV

How Man got the Food Plants

Sowing Grain in Ancient Egypt.

JUST as man selected certain animals which he found useful to him, tamed them and took them round the world with him, so he chose certain plants to domesticate and make his own. Like the horse, cow, dog, cat, hen and pig, they have travelled with him wherever they could live.

We have spoken of some of these plants, — tea, coffee, sugar and spices, — but these are not the great staple foods of life. The grains are the great staple foods of the human race.

We have seen how the savage woman gathered wild grains and ground them into meal between two stones. We have seen how she made the first little garden and planted these grains, and dug around them with a little stick to make them grow. These grains were the seed of wild grasses, rich in food value, but protected by husks, so that they have to be ground into meal before they can be cooked and eaten. Natural man did not cook, any more than birds or foxes cook. Cooking was an art that had to be learned. And as women were the first cooks, it is natural to suppose they were first to discover that this grass seed could be cooked and eaten.

The grains which have come from this wild grass seed are called cereals. As food for man and his domestic animals, they are the most valuable vegetable possessions of man. They give us bread, the staff of life. They give us everything made of flour and meal. We could not keep horses, cows, hens, pigs or sheep without the cereals that are fed to them raw. By furnishing food in great quantities, they made civilization possible. In certain places man was able to

produce vast quantities of cereals easily and quickly. So in these places great numbers of people collected. And as they did not have to spend all their time working for their food, as man in the old hunting days must needs do, they had time for other things. Cities were built. Commerce was established. Wealth was accumulated. Schools and books became known. In place of a few scattered tribes huddled in the wilderness, there arose great nations and countries.

One of the very earliest of these was Egypt. As far back as we can go in history we find great cities in Egypt, mighty buildings like the Pyramids, which are standing to-day, five thousand years after they were built.

Why was this? Egypt is a dry country with almost no rain. Crops do not grow in such countries. There are no great natural pastures there for flocks and herds to graze upon. But Egypt has a great river, the Nile, which is fed with never failing waters in the high mountains where it rises. Every spring it rises with the floods in the mountains. It does not rise high enough to carry off buildings and drown people. It only spreads

in shallow floods over the wide flat lands on either side. When the waters go down they leave a rich, black sediment brought down from the hills, and in this black mud the crops grow luxuriantly. And the waters leave the ground moistened far down for the roots. These rich flat lands, without rocks or hills, are easily cultivated. All this made the valley of the Nile one of the earth's great natural food centres, and here grew up the first great nation that we know much about.

REAPING.

Chaldea and Babylonia, which we read of in the Old Testament, were other early nations that grew up in other rich river valleys not far from Egypt. Far away in eastern Asia other great nations had risen in China and India, but as there was no travel between that part of the world and Europe for many hundreds of years, we do not know much about the early days of those countries.

River valleys have always been centres of population. The land in them is fertile, and will grow rich crops. We call such land alluvial. The soil is light and easy to cultivate. For these reasons, food is plentiful. The river makes it possible for people to get about easily by means of boats. Moving from place to place, mingling with various peoples and knowing different parts of the world, civilizes. China is a very old country, and has a very dense population, about one-third of all the people in the world, it is said. And yet these people almost all live along the banks of the rivers. As one travels away from the coast back into the middle of China, he finds the river banks almost like long streets, with villages or cities on either side. And all the travel is done up and down these rivers by boat. But back from the rivers there will be great stretches of country with very few people. This was the way the people lived in Egypt. Probably there was a time when most of the people in the world lived that way.

Suppose we take two maps of India. One is a "population" map, showing where there are

many people in India, and where there are few. The other is a "product" map, showing what crops are raised in different parts of India. On the population map you will find the valley of the great river Ganges black with people. It is one of the most densely populated regions on the face of the globe.

Now turn to the product map. All along the Ganges you will find printed the word "rice."

Rice is one of the great cereal foods of mankind. We, who use only a little of it in soups and rice puddings, can hardly believe that whole races of people eat almost nothing else. Rice grows richly throughout the valley of the Ganges, so there we find the people massed thickly. And remembering how primitive people put what is valuable to them into their religions, we shall not be surprised to find that to the people of India the Ganges is a sacred river.

Rice is enormously productive. No other crop will give so much food from the same area of land. It needs little fertilizer. This is a great point in its favour, for fertilizing materials are costly and hard to get, and make food more

expensive. Rice will flourish on low, marshy land where the other cereals will not grow at all. So of course it is a cheap and abundant food, and people cluster thickly where it will grow.

Animal food is always more costly than vegetable. We know of only one group of mankind, the forlorn Esquimaux in their snow huts, that lives almost entirely on animal food. But millions of people in different parts of the world live almost entirely on vegetable food.

There are many thousand kinds of plants in the world. Of all these, man has found only a few which are useful to him. He has domesticated more plants than animals. But he has, after all, cultivated only a small number.

Each of these plants once had a home of its own where it grew wild. If you go into one of our northeastern states, say Vermont, you will find a great abundance of wild growth. In the woods in spring you will find violets, forget-me-nots, anemones, bloodroot, spring beauty, hepatica, trilliums, jack in the pulpit and the sweet and beautiful trailing arbutus. You will find many different kinds of mosses, ferns, vines and

trees. Along the roadsides in summer you will find goldenrod and aster, and there are wild strawberries, raspberries, blackberries, blueberries and grapes. In addition there are many plants which, because they have no flowers or fruits that please us, we notice very little. We call such plants weeds.

But you will not find wheat, oats, rye, buckwheat, corn, potatoes, peas, beans, tomatoes or any of the other crop or garden plants growing wild. If the farmer wants them, he must plant them, and cultivate them carefully. Yet all these plants grow wild somewhere. In some corner of the earth they are weeds, as the goldenrod is a weed in Vermont. The people of the countries where they grow wild, seeing that the roots or seeds or leaves of these weeds made good food, began to cultivate them. And as man cultivated them and kept other weeds away, giving room to grow and water when no rain came, they grew larger and better and became very different plants from the wild weeds from which they came.

So also man has taken the little wild strawberry

that grows in our northern states, and has grown from it the great garden strawberry as big as a plum. He has done the same with the wild grape, raspberry and blackberry, and he has tried to do the same with the blueberry. But the blueberry will not live in his gardens. It refuses man's choicest soil and kindest care, and droops and dies when removed from its own wild hillside.

Man wants fruit to eat in addition to meat, flour and vegetables. The fruits of the United States, especially the apple, are among our most important crops. The changing of the wild fruits of nature into our rich orchard fruits is one of the most interesting stories in the whole conquest.

The pear and the apple both grow wild in Europe, Syria and China. The wild pear is a beautiful tree, but its fruit is so bitter and disagreeable that it cannot be eaten. Out of this has been bred the delicious orchard pear.

To do this has taken a long time. Two thousand years ago the Romans had cultivated pears, and seemed to think highly of them. They named the different varieties after their emperors. Pliny, a Roman writer, wrote about pears and

praised them, but he said they left a bitter taste in the mouth and must be boiled in water or wine to be good. So we see that the pear has improved very much since then, for our pears are good when eaten raw, and leave no bitter taste in the mouth.

The French are very fond of the pear, and cultivate it very successfully. Wherever the French settled in America in the early days, they planted pear trees. In Canada, at Detroit, down the Mississippi valley, for many years the old French settlements could be traced by the pear trees they planted. In those days it took twenty years for the pear tree to begin to bear, so those early settlers planted pear trees for their children rather than themselves.

The Spanish settlers introduced both the pear and the grape into California, and many years later when the Americans entered California, they found the old Spanish orchards and vineyards there. It is in ways like this that the cultivated plants and fruits have been spread.

As the cultivation of the orchard fruits goes on, the fruits grow better, and the trees bear earlier and earlier. One reason for this is that the

cultivators plant seeds and shoots from the trees that bear the best and earliest fruit. But a much faster way to improve the trees is by a method called grafting. In grafting, a shoot of one tree is inserted in the trunk of another. The bark grows over it, and it becomes a part of the tree. Then the shoot changes the fruit of this tree. If it comes from a better and earlier tree than the old one, it will make the fruit of the tree better and earlier. So old trees may be changed and improved without waiting for seed to be planted and grow into a tree. The art of grafting trees was a very useful step in man's conquest of nature. The Chinese, who are very old and very good cultivators, never discovered this art. They knew nothing about it until they learned it in recent years from the white man.

Most of the crops cultivated in the United States never grew wild on this continent. All were brought here by the white man when he came. When we think of the rolling miles of golden wheat in our western states, of the enormous crops of cereals and vegetables raised in this country, and the enormous number of people

and animals they feed, we see what man's conquest of the plants has been to him. We see what it has meant in feeding the world and bringing wealth to the peoples and the countries that could raise these plants on a large scale.

Where did these plants come from originally? We do not know where all of them came from, but most of those which we use commonly, both cereals and fruits, came from the countries around the eastern end of the Mediterranean Sea. There, where great nations first arose, is where man first learned to domesticate these wild plants. It was, in fact, because such valuable plants grew wild in those regions, and man learned to cultivate them and raise crops from them, that such great and rich countries as Egypt, Chaldea and Babylonia could rise in that part of the world.

In that region is Palestine, the country where Jesus lived. On the rocky hills of Palestine today grows emmer, the wild wheat. All our cultivated wheats probably come from this wild plant. Grains of emmer have been found in Egyptian tombs which were closed six thousand years ago, showing that people were using it for food

then. Even in recent years useful plants have been introduced into America from that region, — the seedless grape, the Smyrna fig and many varieties of wheat and oats.

Storing the Grain.

One of the earliest spring garden plants in the United States is rhubarb, which some people call pie plant. Stewed with sugar, or made into pies, it is so well liked that market gardeners who supply the city markets sometimes grow large fields of it. Almost everybody who has a little kitchen garden has a few hills of rhubarb. The rhubarb grows wild on the hills around the city

of Cabul in far-distant Persia. The poor people of the villages go out and gather it in springtime, and sell it in the city markets. They pile gravel round the sprouts when they first show above the soil. This makes them grow long and thick. Sometimes they put an earthen jar over the plant. Then the plant grows round and round inside the jar, and is white, crisp and tender. The apricot grows wild on the hills of Persia, and cultivated grapes are so abundant there that people feed them to their horses.

The knowledge of these cultivated plants and the domestic animals spread westward, among people who were still wild or half-wild tribes. It spread first to Greece, a beautiful little country in southeastern Europe, whose people became a very wonderful nation. Then this knowledge spread to Rome, on the western side of Italy. The Romans, at first only a wild tribe living among hills on the Tiber River, became in time the most powerful of all nations, conquering all the countries around the Mediterranean, and almost all of northern and western Europe. Most of Europe lay, in those days, a vast, shaggy wilderness,

inhabited by wild tribes. These hunting, fighting, skin-clad savages of north and west Europe were our ancestors, and for thousands of years they lived just as we have seen other savages living. Then by their conquests the Romans spread their civilization throughout the western world.

When the white men discovered America, they brought with them their accumulated knowledge. They brought seeds and roots of plants, and they brought, as we have seen, their domesticated animals. They found this continent extraordinarily well adapted to both the plants and the animals. And so we have the vast herds of sheep and cattle which graze over the western plains, and the vast fields and orchards filled with wheat and apples.

Some plants the white man found here to help him in his conquest of nature. Maize, our Indian corn, was an American weed. It was a sacred plant among the native tribes of this continent, and the Pueblo Indians of New Mexico still celebrate the corn dance, a yearly festival.

Maize has become one of the most valuable of

all crops, not only as food for man, but also as food for his animals. It is one of the most fattening of all foods, and is fed to hogs and cattle to fatten them for the market. Columbus took the Indian corn home with him to Spain in 1520. Since then it has spread all over the world, and forms the principal food of many countries in Asia and Africa. All over south Europe it grows, and in far-off India it feeds millions. It is the most productive of all cereals, yielding more to the same area of land than wheat, oats or any other of the great cereal crops. It is a wonderful plant because it can be grown alike in the hottest countries of the tropics and in northern lands which have long, cold winters. This is because maize will ripen within five months; some kinds, indeed, within six weeks. So, no matter how cold the winter may be, there is during a short and hot summer enough time for ripening and harvesting maize. Because he can take them with him into various countries, such plants are very useful to man. But in countries where the summer is too cold to ripen it, as in England, maize does not do well.

On the plateaus of South America the white man discovered another weed that has become the food of millions of mankind. This was the potato. It is one of the principal foods of the people who live in the United States. There are probably few families in the northern states of America who do not eat potatoes once a day. Many families eat them twice a day, or even three times. The potato is the chief of all our vegetables. In fact, we hardly think of it as in a class with the garden vegetables, like beets, peas or beans, which we eat now and then. We think of it as a daily food, like bread. So necessary does the potato seem to us that it surprises us to find there are races in Europe who scarcely eat potatoes at all. To the Italians the potato is not an important vegetable. It rarely appears in Italy upon a home table, and not often in the restaurants. This is because Italy is not adapted to potato raising, and potatoes there are few and poor. It is a dry country of brilliant sunshine. The potato must have a damp, rainy country, and so it has done better in England, Ireland and Scotland. The English and Scotch eat as many potatoes as the

Americans, while Ireland has adopted it so thoroughly that, funny to say, this American plant is known as the "Irish potato."

The Spanish found the Indian tribes of Mexico and South America cultivating fields of potatoes. They took the potato home to Spain, and from there it spread into Italy and Holland, but was cultivated only as a curiosity in the gardens. Sir Walter Raleigh took it home to England from Virginia, and it became one of the great food crops of the British Isles. Next to the principal cereals it is the most important of all food plants. The same ground that will produce thirty pounds of wheat will produce one thousand pounds of potatoes. No plant grows more widely in all parts of the world. Even within the Arctic circle it will struggle up out of the frozen ground in the short, cold summer, and produce a few poor, watery potatoes.

Before the discovery of America no white man had smoked. Tobacco was a native American plant, and the Indians understood its use and care, and smoked its dried leaves. Tobacco is a plant which gives man neither food nor cloth-

ing. It is of no real use to him, and yet he likes to smoke it so well that he is willing to pay a great deal of money for it, and tobacco raising is one of the great industries. A great deal of tobacco is now raised in Italy and other parts of southern Europe.

It has been so with all the cultivated plants. Whatever men eat or feed to their domestic animals, they will try to raise in their own country. It is thus that the great staple foods of mankind are now grown all around the world. Rice, which first grew in the East India islands, is to-day one of the great crops of our southern states; and corn, an American plant, is now one of the principal crops in India. The cereals and the other great staple food plants have been known to man for a very long time. No one knows just when they were first cultivated, or who first taught their wonderful value to men. But every now and then a new plant is introduced. There are old people who remember when the tomato was first introduced into America. It was known by the quaint name of "love apple," and ignorant people thought that it produced

cancer. This is an example of the suspicion with which ignorant people often look at anything new.

The American people liked the tomato and found it would grow well here. And so the tomato was "introduced," as is said of new plants, into America. Many tomatoes are now raised. The Italians in their own country eat as many tomatoes as we do potatoes. It is a part of every meal, a part of every soup, of every dish of meat or macaroni. In every country you will find people eating a great deal of those products which there grow easily and abundantly.

Intelligent and enterprising farmers, who wish to make money, now try to introduce new plants. They experiment with plants that have been successful in other countries, and try to get them to grow here. One of the greatest differences between stupid and intelligent people is the way they act toward new things. The stupid person is either afraid of new things, or laughs at them. The intelligent person examines the new thing, to see if it has anything good for him.

Thus the plant alfalfa was introduced into our western states a few years ago. Grasses which

are used to feed animals are called forage plants. Alfalfa, which is a kind of clover, was found to be one of the most wonderful forage plants ever known. In Colorado it grows so tall that a man on horseback is lost to sight when he rides into it. Even his hat is hidden by the tall purple blossoms. Its roots go down twenty, thirty, even forty feet.

No farmer can raise the common crops on the same ground year after year. If he continues to plant corn or wheat or potatoes in the same field, the crop will get smaller and smaller until at last he can raise nothing at all there. The reason is that each plant takes something out of the soil and leaves the soil that much poorer. But in the West alfalfa can be grown for twenty years on the same field, and at the end of the twenty years the soil of that field will be richer than it was before, and will raise better crops of other plants. The reason is that alfalfa takes nitrogen out of the air and puts it into the soil. Nitrogen is a gas which exists in the air, and alfalfa soaks it up as a sponge soaks up water. Then in some wonderful way it puts this nitrogen

into the soil, and this makes the soil richer and more fertile.

Alfalfa will not do so well in the eastern states. It cannot live more than four years on the same field there. It must then be ploughed under. The reason for this difference is that the western soil is full of lime, and alfalfa needs lime. On the great poultry farms which sell thousands of dozens of eggs a year, the poultry men have to feed the hens oyster-shell to furnish lime to make the egg-shell. But the alfalfa contains so much lime that when it is fed to the hens they do not have to have oyster shell. Alfalfa has been worth millions of dollars to the western ranchmen. So we see what it means to introduce a useful new plant into a country.

In 1861 the English introduced cinchona, a South American plant, into India. Quinine is made from the cinchona, and the world uses a great deal of quinine in certain kinds of sickness. It cost over three hundred thousand dollars to introduce the cinchona plant into India, but the profit has been many times that.

Sicily, as far back as history runs, has always

been a wonderful grape country, and much of her wealth comes from the wine made from her grapes and exported to other countries. A few years ago a disease attacked the grapevines of Italy. It swept through the island, killing one vineyard after another until all were dead. Among the poor people who had cultivated the grapes and made the wine great poverty and distress followed. It was found then that American grapevines were "immune"; that is, that the disease of the Italian grapevines would not touch the American vines. So the American vines were introduced into Sicily, and the Sicilian vineyards were restored.

All this is conquest of nature. Nature sent the blight that killed the vines of Sicily. But man counteracted this blight by introducing the American vines.

Man has to do this in some way with every plant he cultivates. He has not conquered nature when he brings some weed from the fields, plants it in his gardens and tends it till it becomes a glorious crop, feeding thousands. No. As soon as he has this food plant growing well,

crafty nature sends something to kill it, and leaves him, after all his hard work, with nothing. Sometimes this blight is a disease of the plant itself, which grows yellow or black in spots and shrivels away. Sometimes it is some worm or insect that feeds on the plant. So the farmer must live in constant warfare with nature. To save his plants he must kill pests that destroy it.

Sometimes a plant will grow well in a country for many years, and then suddenly a pest will appear upon it. In this way the "potato bug" came to America about forty years ago. Americans who were children on farms or in villages at that time can remember how they were set to catch the horrid beetles which covered the potatoes in millions. Perhaps their parents promised them a cent for every quart cup full of the nasty things collected and burned. But not all the fingers of all the children in America could make way against the "potato-bug." Then somebody invented Paris green, a poisonous powder which would kill the beetles when sifted over the plants. As each new pest appears, man has thus to invent something to kill it. The

man who invents something that will kill one of these pests is conquering nature as much as the man who raises a thousand acres of wheat.

We think of nature as a kind and bountiful mother, who gives us everything we have. In books and poems nature is often spoken of as "Mother Nature." But everything man has, he has wrested from nature by long and bitter toil.

Man classifies plants and animals by their use to him. But nature knows nothing of "useful plants." The "poison ivy" in the woods, which poisons the hand that touches it, is just as dear to nature as the wheat that feeds mankind. The potato and the "potato-bug" are equally dear to nature. Nature loves the apple and the worm inside the apple. If man wants to save his apple, he must learn to kill the worm.

Man started his conquest of nature by killing. And he is still killing just as busily as ever. But instead of bears, wolves and wildcats, he is killing mostly worms and insects that prey upon his cultivated plants.

CHAPTER V

The Story of Man's Clothes

WE have spoken only of the food plants, but the clothing plants are just as important. We have seen how women learned to spin the wool of sheep and the hair of goats into yarn and weave this yarn into cloth. But woollen cloth is thick and warm. What must man do for thin, cool materials for summer, and for sheets, pillow-cases, towels and all such things used inside the house?

Here woman came to the rescue. In her search among the wild plants she had found one growing from two to five feet tall, which had a long fibre in its bark. This fibre was very fine, but very strong. When she had separated it from the rest of the straw, soaked it in warm water and dried it, she found that it could be woven into a wonderful cloth, strong, firm, fine, cool, and, when bleached in the sun and dew, as

white as snow. This plant was flax, and the cloth woman wove from it is called linen.

We do not know much about flax in this country. We buy linen in stores, but it comes from other countries and is expensive. But for thousands of years linen was the only cool material that people had for clothing in summer, or in hot countries. Men, as well as women, wore it.

Upon the tombs of Egypt, built six thousand years ago, may be seen pictures of farmers cultivating flax, and weavers weaving it into cloth. This shows how very old is the use of linen, for we may be sure that the women twisted the flax fibre into thread with their fingers for many hundreds of years before mankind grew ingenious enough to invent a spindle to spin it and a loom to weave it. You will remember that Solomon was king of the Jews thousands of years ago in Palestine. In the book of Proverbs in the Old Testament he describes what he considers the noblest kind of woman. Among other praises which he gave her, he said, "She maketh fine linen and selleth it." So Solomon's wise woman not only made linen for her own family, but to

sell. One of the very first independent women workers was probably the weaver. We may be sure that in the very earliest days, when one woman was a better weaver than the others, the others would do all her work for her if she would weave for them. And when money came into use, she made linen for sale.

From this early home of mankind at the eastern end of the Mediterranean, the knowledge of flax passed westward, like that of wheat, apples, and the other food plants. The Greeks used linen, and the Greek women spun and wove it as in Egypt and Palestine. The Romans used it, and the great men of Rome, who had conquered all the other nations of the world in that day, did not think it necessary to wear dark, heavy clothing in summer as our men do. They wore robes of pure white linen, bordered with beautiful purple stripes, to show that the wearers were of high family. The Roman name for flax was "linum," and our word "linen" comes from that.

By the Romans the use of linen, like the other comforts of civilized life, was passed on to the tribes of western Europe, our ancestors. Flax

has been grown in every country of Europe, for it will grow from the hot valley of the Nile to the cold plains of northern Russia. Linen was manufactured in all these countries, first by the women in the homes, then by machinery in the factories. Ireland has always been a great linen-making country, and Irish linen is famous to-day. Our ancestors brought flax to America. In some American homes there are to-day beautiful pieces of home-made linen, spun and woven on their little home looms and spinning wheels, by the grandmothers when they were young.

Why has this great use of linen passed away? Why do we seldom use linen in our dress or homes any more? Why do we see no great fields of flax growing in America? It is because a cheaper material has come to take its place. Linen, for thousands of years the only thin cloth known to mankind, has yielded its place to cotton.

Cotton is a shrubby plant, something like the hollyhock in our flower gardens. It grows wild in the warm parts of Asia, Africa and America. When the flower drops off, it leaves a sort of pod. In this pod are the seeds, and packed around the

Spinning Flax.

seeds is some soft white stuff. This soft white stuff is the cotton.

Cotton has been used in India for thousands of years. It was also used in Egypt long ago, and in other parts of Africa, and it was used by the native Indian tribes in the warmer parts of America.

Why, then, was it not used all over the world, like linen? The reason is that the seeds in the cotton pod had to be picked out of the cotton by hand. This was very slow work. A man could not clean more than one pound of cotton by working hard all day. A cloth which takes so long as this to prepare can never be used very widely.

Why is cotton used so much now? It is because an American, Eli Whitney, invented a machine that would separate the seeds from the cotton very fast. Mr. Whitney was born in Westborough, Massachusetts. He went to the state of Georgia to teach school. There he saw how long the people had to work to get the seeds out of their cotton, and invented his machine, which is called the cotton gin, or the saw gin. This took out the seeds so fast that cotton be-

came the cheapest cloth in the world. Anything that can be made quickly, and with little work, is cheap. Only a few rich people now wear linen, but there is not a house in the civilized world that is not full of things made of cotton. There is not a man, woman or child in the civilized world who does not wear cotton almost all the time. Almost all the thin dresses that women and girls wear in summer are made of cotton. Even a great part of the cloth that we believe is made of woollen, is made of cotton, mixed with a little wool, or made up to look like wool. Cotton is mixed with linen, and with silk, to make them cheaper.

The best and greatest cotton crops in the world are raised in our southern states. The great cotton mills of England and New England run the year round to spin the cotton of our southern states. Millions of people who never saw a cotton plant get their living from the cotton fields of the South.

The production of cotton led to one of the most terrible events in our national history. After the invention of the cotton gin it became very profitable to raise cotton in the southern states.

In the Cotton Field.

The great ships stood waiting to load the cotton crops aboard and take them to England to be woven into cloth in the mills. But the cotton fields must be worked under the terrible, blazing sun of the southern summer. White men cannot stand this work. White men come from cool countries, and they cannot stand such heat. Besides, there were not white men enough in the country to work the cotton fields, which needed a great amount of labour.

So white men went across the sea to Africa

in ships, captured more of the negroes who lived there and brought them to the southern states as slaves to work the cotton fields.

Our terrible civil war between the North and the South grew up over this slavery, and a million men were killed. Women saw their husbands, fathers or brothers march away to the war, never to come back. We read of the little wars between the cattle men and sheep men of the West over the grazing lands. Now we read of this great war brought about by the cotton industry. You see what a great effect the cultivated plants and domestic animals have had upon the life of man.

You must not get the idea that the white men of our southern states were more "wicked" than other men because they kept negro slaves. From the very first, man has tried to make other men work for him for nothing. All races and all tribes have kept slaves at some time or other. At first there was slavery in our northern states as well as in the South. But the North was too cold for cotton. There were no great cotton fields demanding negro labour. So slavery was not profitable in the North, and died out. In the South

men could make a great deal of money by keeping slaves, and so slavery grew year by year.

We spoke of many food plants in the last chapter, and there are many others that we have not mentioned. But of all the plants in the world, only two are used very much for clothing,—flax and cotton. Ramie, a cloth made of a Chinese grass, is sold in some of our stores. Various wild or half-wild tribes in different parts of the world use cloth made of grasses and fibres. But the great mass of all the vegetable clothing worn in the world is made of cotton or linen.

There are really only four materials widely used for clothing in the world, and two of these, as we have seen, are vegetable,—cotton and linen. The other two are animal,—wool and silk. Woollen cloth is made from the wool and hair of many kinds of animals in many parts of the earth, but chiefly from the wool of sheep and goats. For thousands of years the women spun the wool on their little looms at home, as they did the flax. Then men began to run the looms by steam in factories.

Cloth made of pure wool is very warm and

comfortable in winter. It lasts a long time and looks well until it is worn out.

But you will remember how we learned that it is cheaper to eat vegetable food than animal. In the same way it is cheaper to wear vegetable clothing than animal. It is easier and cheaper to raise a field of cotton for cloth, than it is to raise a flock of sheep for the wool. It takes a great deal of land to raise sheep. As the country grows older and more land is wanted for other things, fewer sheep are raised, and wool grows more expensive. So people wear less wool and more cotton.

We saw how man had made one insect work for him, the bee.

So he has set one worm to work for him, the silkworm. The silkworm spins a round ball, just as the spider spins a web. This ball is called a cocoon. The cocoon is made of silk. Man takes it, unwinds it, makes silk thread of it and weaves that silk thread into the beautiful silks we see in the stores.

It was in China that this was first done. The people still gather wild silk there, cocoons spun

by the caterpillars out in the woods and left hanging on the trees. You may be sure that it was woman, ranging the fields and forests thousands of years ago in search of food and clothing for her family, who discovered this fine, dainty web, and learned to weave it. And you may be sure it was woman who first learned to tend the silkworms and feed them at home, so as to gather more of the silk. All through southern France and northern Italy it is the women on the farms who raise the silkworms; and so it is in all silk-producing countries.

The silkworm lives on the leaves of the mulberry tree. It is born, spins its cocoon and dies, all in one month. So in a country which is warm and moist, where the mulberry will yield several crops of leaves in one year, a fresh crop of worms can be raised each month.

This is the case in India, China and Japan, where silk has been made for a very long time, and where many more people wear it than here. The silks of those countries are very cheap and very beautiful. The rich men of those countries wear robes and coats of elegant silks of different colours, richly embroidered.

The traders in western Asia got hold of a little of this silk, took it to Europe and sold it to rich people at a very high price. They made a great deal of money, so much that they were willing to take the long, dangerous trip to China and back to bring more silk It took a year and a half to make the trip to China and back. The journey was made on camel and horseback. The traders had to cross terrible deserts, where they were in danger of dying from thirst and starvation, and they had to pass among hostile tribes who often robbed and killed them. Yet the traders, for the sake of the money they made, kept on.

This was in the time of the Romans. The Romans were a very luxurious, extravagant people. Both men and women, among the rich, liked to wear this beautiful new fabric, silk, and would pay well for it.

About fourteen hundred years ago, under a Roman emperor named Justinian, some of these traders thought it would be a very good thing to bring some silkworms back, so that silk could be made in Rome. The Chinese were a very suspicious people. The traders were afraid to take

the silkworms away openly. But they hid some of the eggs of the worms inside a hollow cane. They managed to get these safely through the long nine months' trip. When they got home they hatched these worms out; and this was the introduction of the silkworm into Europe. From that introduction came the silkworms of Italy and southern France, where they have been raised ever since.

Of all the white men's countries, France makes the best silks. France has made silks for a very long time, because the women on the farms furnished the raw silk. But in France and Italy the mulberry tree produces only one crop of leaves each year, and not so many silkworms can be raised.

We saw primitive man wearing a great deal of fur and leather, which the women made of the skins of wild animals. We still wear a great deal of leather, in our boots and shoes. But we do not use it much for any other clothing. We still use a little fur, but only for outdoor garments in cold weather. The great bulk of all our clothing is made of these four materials, wool, silk, flax and cotton; and there is cotton in all of them.

Anything that is woven is called a textile. And the making of all these cloths to clothe mankind is called the textile industry. For thousands of years, as we have seen, the whole textile industry was carried on by the women with their hands, at the looms and spinning-wheels. Now it is carried on in great mills, by steam or electricity. In Germany, France and England are many of these mills. There are many in northern Italy. In America they are mostly in our eastern states,— Massachusetts, Connecticut, Rhode Island, New York, New Jersey and Pennsylvania. Lately they have begun to build cotton mills in the southern states, close beside the fields where the cotton is raised. There are not many textile mills in the western states. Millions of people earn their living in textile mills. Thousands of stores are run for the sale of textiles. Sometimes they are sold in the form of clothes already made, sometimes by the piece to be cut up and made into clothing. These stores employ other millions of people. So you see what a great industry the textile industry is.

If you go through the mills where textiles are

made, and the stores where they are sold, you will find that more than half the people working there are girls and women. Sometimes three-fourths, sometimes nearly all the workers, are girls and women. This is not strange. Women did all this work at first in the homes. When men took it out of the homes and put it in the mills, women had to follow their work. In the first textile mills in America all the weavers were women, and when men first entered the trade people laughed at them for doing women's work. The principal reason why women are working out in the world for wages to-day, instead of in the homes as they used to, is because the textile industry has been removed from the home to the mill.

Out of the use of textiles has grown the use of dyestuffs. Man likes to have things not only useful, but pleasing to the eye. You remember how the primitive woman used to paint little pictures on her clay dishes to make them pretty. She got her paints from different plants and minerals.

When she began to make textiles she did not like to see them all one colour. She liked to see

them many beautiful colours, and she searched out the plants and minerals that would give her these colors. But she could not paint on the cloth. So she learned to mix her colours in water and steep or boil the cloth in this water. This was the art of dyeing. The making of dyestuffs to dye textiles is now a great industry in itself, giving employment to many people.

CHAPTER VI

What the Mineral World Furnishes

MAN did not get from the mineral world the number of things which he did from the animal and vegetable. The minerals gave him no clothing. They gave him only two articles of food in general use, water and salt. Yet without the mineral world man never could have conquered nature.

You will remember that in the first chapter we saw man pick up two weapons, a stick and a stone. The stone came from the mineral world, and for many thousands of years that stone was man's chief tool and weapon. He made knives, hatchets and warclubs of stones, and the woman made knives, scrapers, hammers and cooking pots. For many ages man had nothing but stone to use for these things.

How do we know this?

We know it because all over the world stones have been found which had been cut or scraped or pointed into knives, hammers or other tools. Nature does not do this. Only man shapes stones in this way. And, as we saw before, the woman's stone cook pots have been found. These things did not wear out when once made. They lasted on and on, like the stones of the field. The people who made them are dead and gone. The very races of mankind that used them have passed away forever, like the Indians from our eastern states, or the Tasmanians from their island. But still these stone instruments are found at times, and are kept in our museums to show the way man lived long ago.

These stone tools and dishes have been found in all parts of the world, showing that all men once used stones in this way. So the time during which man made all his tools of stone is called the Stone Age. The Stone Age was very long. Probably it was thousands of years before man found out how to use anything but wood and stone for tools.

The greatest difference between man and the other animals at first was that man was the tool-using animal. You know that nothing can be made without tools. Everything that we wear and everything that we use, the houses we live in, were made by tools. Man could not have had any of these things without tools.

Man searched very carefully among the stones to find those that would serve him best. He tried many different ones. We saw how the primitive woman found that only one stone would do for her cooking pot, the soapstone. This was the only one that would not break when used to boil food over the fire.

In the same way man found that the hardest of all the stones was flint. So whenever he could find it he used flint for his weapons, his killing tools. The North American Indians made their arrowheads of flint. The first white settlers found those flint arrowheads in their fields, and even yet they are picked up in our woods and fields.

Man, in trying the different stones to find the best, discovered a curious thing. He found that

certain stones when placed in the fire would melt and become a lump of soft stuff. When cold this soft stuff would harden again. While it was soft he could work it easily into different shapes, and when it was cold it would harden in these new shapes. This was a great discovery, because it took a long time and much labour to scrape and grind the hard stones into the shape he wanted. To find a stone which would soften in the heat, so that he could shape it in a few minutes, and then harden in this new shape, was great good fortune.

These stones which would melt in the heat were the metals. It was a wonderful step in the conquest of nature when man discovered the metals.

The first metal which man seems to have used was copper. Much copper is found pure or almost pure in a natural state. Man discovered that this material would melt easily, and that he could work it easily. He could make a hundred copper tools in the time it took to make one of stone. But alas! When his nice smooth copper axe or hammer was cold, he found that it was soft. It

would bend so easily that it was not much good to him.

But in trying different stones, he had found another that would melt, and that was much harder than copper when cold. This metal was tin. He tried mixing the two together. Aha! When it was cold he found he had a fine new metal, easy to work, and hard enough to make good tools. This metal was bronze.

We do not use very much bronze now, because we have found something better. But it was a great discovery for primitive man, because he could have many more tools now that they could be made so much more easily and quickly. We may be sure that some people turned up their noses at this newfangled bronze, and said that the good old stone tools that their fathers used were good enough for them. But the stone tools went out of use, and the bronze tools came in, and the time during which these were used is known as the Bronze Age.

Some tribes never learned to use bronze. They were still in the Stone Age when discovered by the white man, like our Indians, or the Tasman-

ians. These tribes that remained in the Stone Age did not progress far. They remained very primitive and savage. They had no good houses, no good farming, no cities, no books. It takes tools for all these things.

Man found that to get the tin and copper he had to dig down into the earth. So in the Bronze Age man became a miner. White men in their wanderings have discovered very old mines, worked thousands of years ago by primitive peoples.

Bronze was very useful to primitive man, but after a time he discovered another metal, far more useful. With this metal man was to conquer nature, though he did not, at that time, know it. This metal was iron.

Iron is much harder than bronze. It makes a much better tool. But it is also much harder to work. When taken out of the earth in the form of iron ore, it is mixed with other substances. It has to be separated from these other substances by the fire, and man had to work a long time before he learned how to do this.

When man had learned to use iron, he entered

the Iron Age. We are in the Iron Age now. We no longer make tools of bronze or stone. We make them of iron.

When man had once entered the Iron Age, he was on the high road to civilization. He had started in the path that led to the great cities and the great nations of to-day. Any tribe that used iron immediately took a long step ahead of the tribe that did not use it. When white men first went through Africa they found some tribes using iron and others that did not. Those that used iron were much superior to the others. They had better tools and weapons, better houses and farming, they could overcome the others in war.

With the increase of the mining industry, different classes of workers grew up. At first every man hunted to provide his own meat, and built his own shack in the woods. When people wanted a great deal of iron they would give food and clothing and houses to the men who dug the ore out of the ground, and to the other men who made the ore into tools. This differentiation of labour, as it is called, has gone on more and more,

as the world has grown more and more civilized. Different kinds of work are wanted, and different classes of workers grow up to do it. There are now men who spend their whole lives making little steel watchsprings not a quarter of an inch long. The primitive family produced all its own food, all its own clothing, made all its own tools, weapons, house and furniture. This man produces neither food, clothing, house, tools nor furniture. He produces only these little bits of steel. Other people want these tiny springs for their watches, and will give him, for making them, money to buy all the other things he needs.

Man has used iron for a very long time. Except a few primitive tribes, all the races in the world now understand how to mine and work iron. Many metals, like tin, silver and gold, are found in only a few places. But iron is found in almost every part of the world, so that almost all men have been able to get at it.

But for thousands of years man used iron only in a small way. He mined only a little of it, and used it only for the little tools and weapons that he made by hand; knives, spears, hatchets,

hammers and so on. This was using iron a good deal, compared with its use in the Stone Age, but it is nothing compared to our use of iron. Our present civilization is made possible by the use of iron. Millions of tons of iron are taken from the iron mines, smelted in the iron foundries, and used for things that man never before dreamed of. We make our bridges of iron, our ships of iron, our buildings of iron, while up to a few years ago only wood or stone were used for these things. Great factories are full of iron machines, turning out every sort of thing to use, eat or wear, when a few years ago no such machines were known. Millions of miles of iron rails are laid over the earth, and on this iron road the iron locomotive hauls the great trains running on their heavy iron wheels. These things are possible only because of the great amount of iron we now mine.

Man is able to produce these great amounts of iron chiefly because he has discovered the use of another mineral, coal.

Iron can be worked only by fire, a great deal of fire and very hot fire. For a long time the only fuel man used to work his iron with was wood.

Wood is often very scarce. As the earth grows older man burns up the wood, or uses it up to make his houses, boats, bridges and other things. Or he cuts down the forests to make room for his farms. In some parts of the world there is no forest, and there men could not work the iron at all. They had to get it from other countries. It takes, too, a great deal of time and work to cut trees down and cut them up for fuel.

But when men discovered the use of coal, they found vast beds of it in the earth, enough to last thousands of years. This coal can be cut in chunks, and mined far more easily and quickly than wood can be prepared. And it makes a much hotter fire than wood. So with this new, cheap, abundant fuel, man has been able to smelt vast quantities of iron.

With this great use of coal and iron has come what we call the industrial revolution.

A revolution is a complete change in anything. All school children have heard of the American Revolution. America was formerly ruled and taxed by England. After eight years of war the English armies were completely de-

feated, and Americans governed and taxed themselves. This was such a complete change in government that it was called a revolution.

France, Italy and other countries have also had revolutions, in which they made complete changes in their form of government. But all the revolutions by war put together have not made so great a change in the world as has the industrial revolution

If you walk along the quiet side streets of any city to-day and keep a sharp watch, after a while you will see a wooden boot hanging over a door. If you go in you will see a man sitting on a low seat in a dark, dirty little room, mending a shoe. This is the cobbler, and he makes a living by mending shoes.

Once the cobbler made all the shoes, as well as mended them. Now he does not make shoes any more. The shoe factory can make hundreds of pairs of shoes while he is making one. But the cobbler is still able to earn a little by mending shoes.

So to-day you will see the blacksmith shoeing horses in his little shop. Once the blacksmith

made the horseshoes there, as well as put them on. He made the nails he put them on with, and all nails, and all the tools and implements of iron the people used. There was one other hand worker in iron, the armourer. He made the weapons, the swords, spears and daggers that men used in war. He has entirely passed away. Everything that he used to make is now made in factories. But the blacksmith still lingers to shoe the horses.

Once everything was made in little shops by hand, just as the cobbler and the blacksmith work to-day. Whatever the women did not make in their own homes was made by men in this way. This was true all over the world only a few years ago. It is still true in some parts of the world. Travellers in Sicily to-day will often see a yard full of jars, jugs, pitchers, bowls and other dishes, standing in long rows in the sun to dry. This is the potter's shop. He is making these dishes by hand, just as the primitive woman did thousands of years ago. Many things that the people use are so made in Sicily and other parts of Italy; and, throughout Asia, almost everything.

But in the United States, England, Germany, France and the other countries of northern Europe, almost everything the poeple use is made by machine. And the factories of these countries are sending more and more machine-made goods over the world. For example, a few years ago all the pans, basins, coffee-pots and so on used by the Sicilian women in their kitchens, were made of copper, and this copper was beaten out by hand into the shape wanted, by a man sitting in a little room like the cobbler's. But now the factory-made pans and skillets from America are being sold more and more in Sicily, and the old copper maker is passing away.

So it is all over the world. The countries that are making things by machine are selling to the rest of the world, and they are the richest and most powerful countries in the world, because the other countries buy from them.

This change from hand work to machine work was the industrial revolution. It meant a change in the whole life of the world. It gave millions of people things they never had before. It set free a vast amount of labour, and it gave people

a great deal of time that they did not have before.

To understand how it could set labour free and give people time, let us go back to the primitive woman, making the leather clothes for the man. Remember her needle of bone, threaded with fibres. Just as this primitive woman sewed in the forest, so all women sewed until a few years ago. The bone needle changed to one of metal, but still she pushed it wearily in and out, in and out, one stitch at a time, over and over, day after day, year after year, life after life.

Suddenly, one day, some one put a machine in her home, the sewing-machine. On that she could sew in a day what it had taken her weeks to do before, and the sewing was much stronger. The long, long slavery of the needle was lifted from her. She had time now. Time to read, time to study, to rest, to travel, and still she could do more sewing and do it better than before. This was only a few years ago. Probably the mothers of some children in your school can remember the first sewing-machines.

This is the revolution that has taken place in

every kind of work, whether done by men or women. Boots, shoes, hats, cloth, clothes, dishes, furniture, lumber, nails, tools, everything we use or wear, is made by machinery, where once it was made by hand. Farming and mining are done by machinery. We have passed beyond the Age of Iron. We have entered the Age of the Machine.

It is the countries that have coal and iron, and are using it to drive their machines, that are living in the Machine Age, and that are introducing the machine into the rest of the world. And it is these countries that are leading and ruling the world to-day.

England, to illustrate, is a small country. It is a cold country, with a poor climate for farming. In many parts of the island corn will not ripen. It has no great plains for herds of cattle and sheep. No rich tropical fruits grow there, nor even enough beets and turnips to feed the few cattle that are kept. England cannot raise nearly enough food to feed her own people. Almost all her meat, fruit, flour and other food comes from other countries. She gets mutton

from New Zealand, beef, pork, flour and apples from the United States. From every part of the world she draws her food supply. England is an island, and if the ships should stop running for one week, her people would begin to starve.

And yet what do we find in England? A few poor, half-starved people, huddling in their rainy island?

Not at all. We find a rich and smiling country full of beautiful homes. Her banks are full of gold and silver, her shops are full of jewels and costly goods. The English are among the richest and most powerful people in the world. They have sailed out over the globe, and have established vast colonies,—Canada, Australia, New Zealand and India,—and all these are welded together into a mighty empire. How has England done this?

England was the first country that made extensive use of machines. She was the first to change from the old, slow way of doing things by hand to the modern way of doing things by machinery. She was the first to weave cloth by machinery, and all the rest of the world began to buy this cloth from her.

England cannot raise any cotton. The climate is too cold. But the great ships used to stand in the ports of our southern states, waiting to load on the cotton raised there. Then they would take it away to England, three thousand miles. The English mills would weave it into cotton cloth, and then the ships would bring it back again, and sell it to the people who raised the cotton. You see what a loss was here! All the trouble, work and expense of carrying the cotton three thousand miles and back, because America did not yet know how to make her own cotton cloth.

In the same way all parts of the world were sending raw materials to England to be made into manufactured goods in her factories. Then they would buy back these manufactured goods, at a great profit for England. She grew rich very fast, and her huge ships went all over the earth, bringing raw materials for which she paid little, and selling manufactured goods for which she charged much.

Anything from which other things are manufactured is called a "raw material." Wheat is the

raw material of flour, sugar-cane of sugar, cotton of cotton cloth. It is a very profitable business to take these raw materials and make them into things that people can eat, wear or use. England was the first to do this on a big scale for the rest of the world. This is the real reason the English are a rich people in their little cold country.

England understands this very well, and has always tried to keep things arranged so that she can sell manufactured goods to everybody else. In the days before our Revolution, when there was a great deal of dissatisfaction in this country with English rule, William Pitt, a great English statesman, said in Parliament, "America has not the right to manufacture even a horse-shoe nail for herself."

The English wanted to manufacture all the horseshoe nails, and everything else, and sell them to the American colonies at a profit.

England became a great manufacturing country because she had both coal and iron, and the coal and iron mines were close together, so that there was plenty of coal close by to smelt the iron.

Another source of England's wealth was in

selling coal to countries that had none. Her coal mines lie close to the sea, and it is easy to load the coal on the ships and take it away to other countries. Italy has many ships, but it has no coal. So the Italian ships to-day have to sail through the Strait of Gibraltar and north to England to get coal; while the English ships get their coal at home.

To-day we find in England coal towns. In some of them scarcely a green thing can be seen. No one there raises anything to eat. The earth is black with coal dust, and the sky is black with smoke. For close around the coal mines cluster England's factories, making with coal and iron millions of different things to sell to people all over the world.

We have seen men living by their herds of sheep and cattle in the West. We have seen other men live by their great wheat fields and fruit orchards. Here we see men who make their living by industries dependent upon minerals.

It is exactly the same in the coal and iron towns of Pennsylvania, and in some other parts of the United States. The value of minerals

draws men away from the farms, the green fields and all the pleasant places of the earth, to make them spend their lives digging in the ground.

So gold first drew men to Australia and California. Australia is now a great sheep country, California is now a great wheat and fruit country. But men first went to those countries for gold. Gold is now building up Alaska as it did Australia and California. Men will even live in the frozen North, where there is six months' night in winter, for the sake of gold. And other men will send them food and clothing in exchange for their gold.

A very strange example of a group of towns and cities dependent upon the mineral world for life exists in Chili, one of the countries of South America.

High among the mountains of Chili lies a desert. On this desert there is not one drop of water. No rain ever falls there. No spring or brook is found. Not one plant grows there. Not one animal lives there. It is an absolute desert, with no life of any kind, because life cannot exist without water.

In this desert are vast beds of nitrate of soda. This is a mineral very good for fertilizing the

land. Farmers, especially the farmers of England, buy a great deal of it to make their crops grow better. Silver, gold, copper, iron and other minerals are also found there in small quantities.

All through this desert are villages and towns. The people in these towns are all miners, mining the minerals to be sent away. Every mouthful they eat, everything they use and wear is brought to them by the railroad. At first all the water was brought by railroad, too. But now the larger places bring water in pipes from a great distance. In one of them the water comes from a lake a hundred miles away.

Chili has a rich and fertile farming country, and a long sea-coast. And yet five-sixths of her revenue comes from this barren, dreary desert. We see how man has conquered nature when he can make his home upon a desert which gives him not a drop of water or one mouthful of food.

There is another very strange town in South America, Cerro de Pasco, in Peru. This town lies near the equator, in one of the hottest regions on earth. But it lies up among the mountains, nearly three miles high. The altitude makes its

climate so severe that life almost ceases. Hens will not lay eggs; no child or sheep is ever born; sometimes dogs, on being taken there, die. And yet there is situated a city of 14,000 people, who mine silver. Everything they eat, use or wear is brought up to them from below, and they pay for it with their silver.

This seems a very strange way to live. And yet is not life in New York City almost as strange in certain ways? In New York there are four million people, more than in many of our states. These four million people raise no food. If they were cut off from the rest of the world for a week, they would begin to starve. There are no wells in New York. All the water is brought from a great distance in pipes. If New York were cut off from her water supply for three days, millions would die of thirst. In one way, life in New York City is just as artificial, just as unnatural, as that of Cerro de Pasco. And so it is in London or any other large city. Man has conquered nature so that he can carry food and water wherever he wants them.

He does this by means of machines.

CHAPTER VII

Man's Servant, the Machine

WE have read of man's first helpers, the pack animals. We have read how woman, carrying her burden upon her back, was the first pack animal. We have read how man tamed the horse, the dog, the ox, the llama, camel and other animals to carry his property and do his work. And we have seen how commerce and travel could not begin until man had tamed these animals.

But there was a far greater helper for man than any of these. Man has forced nature herself to carry his goods and do his work for him.

It was a long time before he could do this. But we saw that in one way he made a beginning very early. He noticed the logs floating down the stream. Perhaps he saw birds or animals on these floating logs. Perhaps when swimming he found that he could climb on a big log and ride

downstream on it. So he learned to tie several logs together with stout vines and strips of rawhide, and make a raft. On this raft he could load many things. The water without any work on his part would carry these downstream for him.

It was much harder to go upstream, but he learned to shove the raft along with poles. After this, he learned to make boats. One of the earliest ways in which boats were made was to take a very large log and set it afire on one side. By managing the fire very carefully it was made to burn out a boat-shaped hollow in the log. In the hollow the man could sit, and he could also carry other things there, and pole this log boat around in the water. With his rude stone tools he managed to make many other kinds of boats.

For his beautiful birch-bark canoe the Indian took the bark of the birch tree, and shaped it around a framework. This was one of the most graceful and beautiful boats ever made by man.

But long before this, men in some parts of the world had noticed there was in nature another force that would carry things. He saw leaves blowing on the wind. He saw that the wind

carried these leaves. He saw that the wind moved branches, just as if he had moved them with his hands. After a while, some man fastened two poles to his boat, one on each side. To these

"Man had discovered the Sail."

poles he fastened a blanket or a mat. The wind, blowing against this mat, drove the boat along. Man had discovered the sail.

Man became very ingenious in managing the sail. He learned to travel far with it, even around the world. You know that Columbus discovered

America by means of sailing vessels, and that later the first man to sail around the world, Magellan, did it in a sail-boat. For thousands of years the sail was man's greatest friend and helper. He travelled mainly on the Mediterranean sea, and great cities would be found on the shores of this sea, when a few miles back from the shore there would be only wilderness. It took about a thousand years to settle Europe, kill off the wild animals, and cover it with roads, villages and cities. But man had only the horse and the sail to help him move about.

One other device for carrying his goods man invented very early, — the wagon.

The wagon was first used in the region at the eastern end of the Mediterranean, whence most of our cultivated plants came. It was a great invention. A horse can drag a much heavier load in a wagon than he can carry on his back. Everywhere the white man has gone he has taken wagons of some kind with him, and they have been one of his greatest helpers. The first wagons were very rough affairs. The wheels were just round slices of a log hacked off, fastened to poles.

Boards were laid across this and the wagon was hitched to the horse. After a while wheels of solid plank were used. Then man learned that the wheels need not be solid, that he could make a wheel of spokes. This would be less heavy; and a rim of iron would make the wheel last longer. So, with one improvement after another, the work went on, until the best and greatest wagon to-day is the automobile, which runs by machinery.

When man had invented wagons, he needed roads. Roads are one of the most useful improvements of mankind. It is impossible to get about over the country without them. The Romans, more than a thousand years ago, showed what a great nation they were by building splendid roads to all parts of western Europe. Those roads were made so well that remains of them can be found to-day, more than two thousand years later. Every civilized country has roads, and the more civilized it is, the more and better roads it has.

When they found the white man's horses running wild in western America, the Indians seized upon them. The Indians became very fine riders.

And the Indian women invented a queer kind of wagon. Before this invention, when an Indian family moved from one place to another, the women would make everything they had to carry into great packs, for carrying upon their backs. Inside these great packs were placed the tent poles.

After she got the horse, the Indian woman fastened the tent poles to the horse and let them drag behind him on the ground. Then she fastened the other things she had to move to these tent poles, and let the horse drag them. The Indians of our western country had used the horse for three hundred years before the white people from our eastern states went west and discovered them. Yet in all that time the Indians had never invented a better wagon than these poles dragging on the ground.

Man had for some time used the water to move his boat. He had used the wheel to move his wagon. Now at last he saw a way to make the water and the wheel work together. He saw that water falling down a steep place in the rocks — a waterfall — would turn a wheel. He learned to

fix a big wooden wheel so that the water falling on it would turn it round and round. To this wheel was fastened a great stone. As the wheel turned, the stone turned with it, and ground the grain beneath into flour.

This was the first mill.

By it for thousands of years man ground all his flour.

By it woman was released at last from her long slavery to the millstone.

But in African villages, in the Indian villages of our southwestern states, through much of Asia, wherever there are wild or half-civilized people, you may still hear all day the slow, monotonous grind of one stone on another, as the women grind the grain. Long ago, however, civilized man with his water-mill relieved woman from this slavery. In many parts of Europe even yet flour is made by little water-mills. Where such mills exist, the farmer loads wheat on his horse's back or into a wagon, takes it to the mill, has it ground into flour and brings it home with him. He leaves part of the flour to pay the miller for his trouble. When the white man came to Amer-

ica he brought his water-wheel with him, and for many years in this country the farmers took their wheat to such a mill and brought it home as flour.

Where there was no waterfall, man learned to build dams across the stream, and make the water fall so as to turn his wheel. But in some countries there were no rivers to turn the wheel. Here man learned to make the wind turn his mill. He fastened a sort of sail up in the air, a round sail with arms stretched out to catch the wind. The wind blew this round and round, and it turned the millstone down below. This was the windmill. To-day in Sicily, a dry country without many streams, almost all the flour is ground by windmills.

Man made a great step in the conquest of nature when he conquered the water and the wind. When the ox and the horse worked for him he had to feed them. They ate a great deal, and he had to raise large crops for their food. Then, they lived only a few years. But his water-wheel and his windmill, once in place, lasted, with a little repairing now and then, many years. And the water and the wind did his work without food.

Man had now reached a stage in civilization where he was fairly comfortable. He had attained a good amount of power over nature. He no longer got his food by hunting and fishing. He raised crops of many cultivated plants and had herds of animals for food. He no longer had to chip and hack away with rough stone tools. He had many kinds of hand tools, made of iron. He could work in wood, gold, silver, copper, bronze and other metals, and could make very beautiful things of them. He lived no longer in a shack in the forest, but in comfortable houses of wood, stone or brick. He had roads, wagons, sail-boats and large sailing ships. He had water-mills and windmills to grind his corn and to do a large amount of other work for him. He had not yet learned to use cotton very much; but he had linen for summer, and wool and fur for winter. He had learned to make many beautiful fabrics of silk, satin and velvet for the use of those who could afford them. He had built many cities.

In the homes of the rich were many beautiful and costly things, — jewellery, dishes of gold and silver, handsome furnishings, rich clothing.

People who had money dressed in silks, satins and laces.

But even these rich people lived uncomfortably. They had no stoves. Stoves were not yet invented. Often there was not even a chimney in their houses. A fire was made on the stone floor, and the smoke filled the room. They had no furnaces, no hot water or steam-pipes to make the houses warm in winter. They had no gas or electric light, even no lamps. Their only light at night was from candles, made of tallow or wax by the women. And if the houses of the rich were cold in winter, dirty, smoky and uncomfortable most of the time, the poor people lived very badly indeed.

In the stage to which we have now followed man, he lived for a long time. In fact, he stopped living that way only a few years ago, and millions of people in Asia, Africa, and even in Europe and America, live in very much the same way now. Man had not yet conquered the machine. But a different and better time was coming.

Long ago men saw that water, when heated very hot, became a different thing. It became

steam, and this steam would float away in the air. In fact, it had to get out, and if shut up in a vessel so that it could not, it would burst the vessel. Still it was long before men learned to make steam work for them. The first man who found how to make steam work was James Watt, a Scotchman, in 1769. In that year he invented a device which gave us the steam-engine, almost as it is to-day; the steam-engine, which will draw great trains of cars and run great factories full of machines. Men had tried to invent the steam-engine before, but the machines they made were not good. Watt was the first one who made these machines successfully.

This was the beginning of the industrial revolution. Just as long ago man harnessed the wind and the water and made them work for him, so now he harnessed the steam and made it work for him. But even yet he did not imagine or dream the work that steam would do for him.

It has been easy so far to explain man's inventions, because the water-wheel and the windmill are simple things, and people who do not know anything about machinery can understand how

they work. But it is not possible for boys and girls to understand the locomotive, or the large and complicated machines that fill our factories. It is not possible for them to understand how man harnessed the steam to these machines and made it work them, just as long ago he harnessed the horse to the wagon. It is easier to understand what man has done with steam than how he did it.

There remained yet many things in nature for man to conquer. Of these, one of the hardest was distance.

Up to a very recent time, hardly more than sixty years ago, it was very hard for man to get about over the surface of the earth. Everywhere he must travel over land on horseback. Only in a few places, where there were good roads, could he go in wagons, and this method was just as slow. It took days to get from New York to Boston, a distance we travel by rail in eight hours.

The world moved slowly. It took a long time to get things done. It took a long time to hear news, even of important happenings. The President, as you know, is elected on election

day in November, but he does not go to Washington and really become President until the next March, four months later. This custom shows how slowly events moved in the days of our grandfathers. When our government was first established, only about a hundred years ago, it took four months for the news of election to get over the country, so that everybody knew who had been elected President. And this explains the arrangement for the President's taking office. Now everybody in the United States knows who has been elected president the morning after election day.

Man has conquered distance. He has done this in various ways.

He found a way to make his wagon move by steam. He hitched this steam wagon, the locomotive, to trains of cars. He laid iron rails to make a road for trains to run on. He carried this iron road over great mountains. Sometimes when the way over the mountains was too difficult, he dug a hole straight through the mountain, and the train whizzes through this tunnel and is out on the other side in a minute,

when it would take the horse, the mule, burro or llama days to climb over the top and down the other side. Man now tunnels under rivers as well as through mountains.

So man has conquered the distance. The building and operation of railroads has become one of

"He hitched this Steam Wagon to a Train of Cars."

the greatest industries in the world. There are two hundred and fifty thousand miles of railroad in the United States alone. Man is now building his railroads into the remotest corners of the world across deserts where once only the camel could travel. He has almost mastered the earth.

In the same way he has harnessed steam to an engine and by it pushes his boats through every

sea and ocean. The journey Columbus on his first voyage made in sixty-nine days can be made now in eight. Captain Cook spent the three years from 1772 to 1775 in sailing around the world. In the summer of 1913 Mr. John Henry Mears went around the world for a New York newspaper in thirty-six days.

In other ways than these, man has conquered time and distance. From the earliest times he found it very difficult to send messages. If he could not go himself to tell people what he wanted them to know, he had to send some one else, and this took time and money. When news had to be sent quickly man devised various methods of doing it. On hills along the coast of Sicily you may see to-day little old ruined watch-towers. In these, watchmen used to look out over the sea and watch for the boats of pirates coming up from the African coast to catch people and carry them away into northern Africa as slaves. When they saw the pirates coming, the watchmen would signal to warn the cities on the plain below.

In some parts of the world people used to build signal fires on the hilltops, to warn people of

danger in time of war, or to call men together to fight an enemy.

Perhaps you have read Longfellow's poem, "The Midnight Ride of Paul Revere."

When the British attacked Boston at the beginning of our war of the Revolution, the men of Boston sent their bullets and powder, hidden in rubbish carts, out into the villages of Lexington and Concord. Outside the city they stationed Paul Revere, who was to watch for a signal. If the British found out about their sending the ammunition away, the men of Boston wanted to warn the men of Lexington and Concord. So they promised Revere to hang a lantern in the tower of a church if the British decided to pursue the ammunition. So Revere waited in the dark, until he saw the lantern. Then at breakneck speed he rode away on his horse and warned the farmers of Lexington that the British were coming to attack them. When the British came marching in next day they found the farmers with guns all ready for them, and there was fought the first battle of the American Revolution.

Longfellow's poem is beautiful, and the story

of Paul Revere is a good story, but no one would hang a lantern in a tower to send a message now. If you think a moment, you will know what they would do. They would telegraph to Lexington.

What is the telegraph?

The telegraph is an instrument to which man has harnessed electricity. He has harnessed the electricity to wires, as he harnessed the water to his mill-wheel, the wind to his sail, the steam to his locomotive.

But what is electricity?

Electricity is a force that is found in nature. You cannot see electricity, just as you cannot see the air. But electricity, like the air, is all about us. The earth is full of it.

Lightning is electricity. When this great quantity of electricity is discharged in the air, there is so much that we can see and hear it. We see it in a blinding and dangerous flash of light. If lightning strikes something on the earth, that thing may be destroyed instantly.

Long ago man watched the lightning with fear and trembling. He watched it strike great trees to the earth, or set the forest on fire, and he did

not know what made this terrible thing. Sometimes he thought it was an angry god, striking from the skies to kill him.

When electricity is present in small quantities, we cannot see, touch, taste or hear it. Therefore, for long ages man did not know much about it. But little by little, now by one small thing and now by another, man saw that there was in nature another great force, like water, wind and fire. If you rub the cat's fur in the dark, you will see sparks of light. These are electric sparks. The cat's fur is full of electricity. Many other things are full of electricity.

Little by little men found out about electricity, and how to use it. In 1843 Samuel Morse, an American, found out how to use electricity so as to make it send a message along wires. If a wire was pressed at one end, by a little key something like a typewriter key, the motion would be sent along the wire to another key, perhaps a thousand miles away. Morse made an alphabet for this instrument. Certain taps on the key meant "a," other taps meant "b," and so on through the twenty-six letters. So man has harnessed the

lightning to a little wire, and made it take his messages round the world for him. Swift as the lightning flashes, so swiftly does the electricity take the messages along the wires. Since Samuel Morse invented the telegraph, another American, Cyrus W. Field, has laid the telegraph wires under the ocean, so that messages can be sent from continent to continent. Still more wonderful, an Italian, Marconi, found out how to send the messages without any wire at all through the air itself. Now ships at sea can speak to each other by wireless telegraphy. If a ship meets with an accident and is in danger of going down, her wireless instrument sends out a call into the night, "Help, Help, Help." And ships a hundred miles away will turn and hurry toward the ship in peril.

More than all this electricity has done for man.

Perhaps sometimes you hear a little bell ring in the room where you are sitting. You take down a little black tube, hold it to your ear, and hear your friend speaking. Perhaps your friend is in the next street. Perhaps he is a mile away. Perhaps he is in Chicago and you are in New York.

Still you know his voice and can hear him perfectly well. The instrument which makes this possible is the telephone. In the telephone the electricity carries over the wire the sound of the voice instead of the touch of the finger. Man has harnessed the electricity to an instrument that will carry his voice. What a marvellous conquest of the distance is this! It is more wonderful than any fairy story.

Man has harnessed electricity to other things besides the telegraph and telephone wires. He has made it run trolley cars for him. Now he is beginning to use it instead of steam for railroad trains. In a few years all trains will be run by electricity. The dirty black soot from the locomotive will cease to come in at the car windows. The hot, black, noisy locomotive, with men sweating as they shovel coal in at the furnace door, will be gone, and the long train of cars will run with no engine at all. The electric power to run it will come along the wires from a great machine many miles away, and one man will be enough to guide the train. Six electric stations, placed five hundred miles apart, would supply power to run

a railroad train across America from the Atlantic to the Pacific, a distance of three thousand miles.

Do you understand how this is possible?

To drive a nail into a piece of wood with a hammer you must use strength, force, power. You know you cannot drive the nail in by tapping it lightly.

So the wind blowing through branches of the trees has power. The boatsman sets up his sail, and the power of the wind carries his boat along.

Steam, when it pours out of a pipe, has power, — power enough to drive machinery. To produce steam, water must be heated; and to heat water, men must mine for coal, and then must send it long distances by rail to the factories.

The water falling over the waterfall has power also. There is so much power in the waterfalls that the French call them "white coal." Men have learned how to change this power into electricity and use it, just as they learned how to change water into steam and use it. The great volume of water pouring over Niagara Falls has, of course, immense power. A little bit of this

power, changed into electricity, is used to run all the trolley cars in the city of Buffalo. A little is used to run many factories in that region. And still only a fraction of the "white coal" of Niagara has been used.

The power of water changed to electricity is enormous. And as man makes use of its power for transportation, he will no longer need steam. Perhaps the children who read this will live to see the locomotive pass forever away.

Man is even now beginning to use electricity for running the machines in his factories. Every factory run by steam must have its own furnace and boilers. But electric power for hundreds of factories can be supplied from one great central electric plant. At the proper time in the morning a button would be pressed, just as we press a button to turn on the electric light in our houses. This action would turn on the electric power and start all the great machines in the factory to work. What labour would be saved!

We began to use steam only a hundred years ago, and steam has changed the face of the world. Yet already we are passing from the age of steam

to the age of electricity; and electricity will change the face of the world again, perhaps before the children who read this are old. Perhaps the greatest difference between the civilized world and the primitive world is that the civilized world changes so much faster. Primitive man worked with his poor old stone tools for thousands of years. Then he worked with his bronze and iron tools for thousands of years. Now he has worked with steam scarcely a hundred years, and already he throws it aside for electricity. The day will probably come when there will not be a coal fire in New York City. Electric stations will be placed on rivers many miles away; and the power of the falling water will be changed into electric power and used to turn every wheel, to run every factory and trolley car and to heat every house in New York. The housewife will have no stove or range in her kitchen. She will not make a fire in a coal stove, or light the gas in a gas range. She will have a table, with some little wires, and some little iron plates. When she wants heat to cook anything, she will press a button, and the heat will be there, sent by the electricity quick as

lightning. All the dirt and trouble and heat of stoves will be done away with.

Electricity used in one way gives heat; in another, it gives light; in another, it gives power to run machines and cars. Is not its use a marvellous conquesting of nature? And to use this power of nature men will not have to spend their lives toiling underground in the dark mines to get coal. They need only use the power of the falling waters.

CHAPTER VIII

The Growth of Civilization through Trade

WE have seen how the primitive tribe got all its own food and clothing. It bought nothing of any one else. It had no trade, no commerce, no money. It got all it had out of the woods, the waters and its own labour.

There are still people who live in this primitive way. Let us examine one such group.

We will take for illustration the people of Switzerland, a little country in the centre of Europe.

In Switzerland are the Alps mountains. These mountains are very beautiful, very high and even in summer are very cool. So a great many people go there in hot weather, to enjoy the cool air and beautiful scenery.

The poor Swiss people, who live by farming among the mountains, do not so value the scenery. They value chiefly the broad mountain pas-

tures, covered with rich grass, which they find high among the rocks. These high pastures they call alps; and it is from these cow pastures, not from the proud, snow-clad peaks, that the mountains take their name.

These mountain pastures are snow-covered in winter and late into the spring. But in summer they are covered with rich pasturage. Cows grow fat on it and give a great quantity of rich milk. How do the cows get this fine grass? The people cannot live up there among the high hills. They must live down below in the valleys, where it is not so cold, where the snow is not so heavy in winter, and where they can get about more easily.

The Swiss peasants conquer this difficulty by driving the cows up to the alp pastures in the summer. It is a long, hard climb; and when they reach the pastures, the cows remain till fall. At the beginning of summer, some of the men, and sometimes women, climb up to the alps, driving their cows before them, and camp out there in rough shacks until the summer is over and the grass is gone.

"The Swiss Peasants conquer this difficulty by driving the Cows up to the Alp Pastures in the Summer"

But what becomes of the milk, high up there among the mountains? How do the peasants make any money from it?

The Swiss solve this difficulty by making cheese. The men carry up huge kettles on their backs. They gather wood for their fires from the fir woods. All summer they stay making cheese. In the fall they come down, driving the cows before them, and bringing great packs of cheese upon their backs.

Now let us go into one of the valleys of the Alps, called the Val d'Anniviers. Let us study the life of the Anniviards, the people who live there.

Through the valley runs a river, and along the banks of the river are good farm lands. Here are the farm-houses, with a church in the midst. Each family builds, of logs or lumber secured from the forests on the mountain side, its own house, barns and other farm buildings. The furniture, too, is made out of wood from the forest by the men of the family. In the same way they get wood for their fires.

In the valley the people raise certain grains and vegetables for food for themselves and for

the winter use of their domestic animals. Each family takes its own grain to a little old-fashioned mill and brings back the flour, as we read in another chapter. Each family keeps sheep or goats, and the women spin and weave the wool into cloth to clothe the family. The women of each family also plait straw to make the summer hats of both men and women.

In spring, as we have seen, the men drive the cows up into the high alps. These go to their own alpine pastures, which are really parts of the farm. They take up to the alps with them pigs and goats. The pigs grow fat on the whey, which is the part of the milk left after the cheese is made. The goats will climb among the rocks and feed where the cattle cannot go. Quantities of cheese are made of goats' milk.

But there is a third section of the Anniviard farms. The valley where the village lies is too cold for fruit trees or vineyards. Down below, in the broad sunny valley of the Rhone, grapes and fruit will ripen.

The Anniviards do not drink tea, coffee, beer or whiskey. They drink wine, made of grapes.

They make their wine at home, and drink a little at each meal, as we do tea or coffee.

For their supply of wine, they have bought vineyard and orchard land in the Rhone valley. In the summer some one goes down to look after the vines and trees. Then in the fall the whole village goes down to harvest the grapes and fruit. They make their own wine there, by pressing the juice out of the grapes and putting it in kegs or jars. The women preserve the fruits for winter.

Now the winter has come, and the Anniviard has only to feed the stock in his barn. With the storms of the Alps roaring outside, he remains safe at home. He has butter, cheese, preserved fruits and meats, and wine in his cellars, all from his own land. He has flour, made from his own grain. He has warm woollen clothes, made from the wool of his own sheep. He has plenty of wood to keep him warm, cut by his own hands in the forest. His living now costs him hardly a cent. Sometimes he is not able to raise quite enough to feed his stock through the winter, and has to buy a little. But it is the ambition of his people

to raise everything they eat, wear or use. They are really ashamed when they have to buy anything.

This is an example of an independent group of people, a self-sufficing group. They do not depend on any one else for what they have. They sell very little and buy very little. They have very little money, and they have very little need for money.

This seems a splendid, independent way to live. But the Anniviards have been living in this way in their valley for many hundreds of years, and few have heard of them. They have never produced a great man or woman. No one of them has ever written a great book, or made a great invention. They are a very ignorant people. They do not go away to school. They do not travel. They have no books. They have no bathtubs. They do not wash often. The great inventions that have changed the face of the world, the use of coal, iron, steam, electricity, the railroad, steamship, telegraph, telephone, have not come from the Anniviards or people like them. If a great avalanche should sweep down from the

mountains and bury all the Anniviards in their valley it would matter little to the world.

Once all people were living in much the same way as the Anniviards, — in little independent groups that produced all they used and had nothing to do with any other group. This is the way the primitive tribes lived. This is the way the Esquimaux live to-day, and the Fans in the African forest, and the Anniviards in their Swiss valley.

These little groups were suspicious of each other. There was a great deal of fighting among them, and they went to war with one another very often. Everybody kept very carefully to his own village and his own tribe. It was dangerous to travel. How did people come from such little, hidden, lonely groups, and build great cities? I will tell you how one group came to do it.

A long time ago a very fierce and dreadful tribe called the Huns came out of Asia and spread over eastern Europe. The Huns were great fighters and killers, and the native tribes of Europe fled before them.

One band, running away from the Huns, found

a place of safety on some low, muddy islands near the head of the Adriatic Sea. Look on your map of Italy and find the Adriatic.

The Huns did not follow these poor fugitives. They did not care enough about them or their poor islands. For these people had there no good farming lands like the Anniviards, no rich pastures, cattle, orchards or vineyards. Their islands were so wet and marshy that crops would not grow there. They could not produce their own food or clothing. They had nothing to build houses with.

What they did was this: In their boats, in which they had reached the islands, they took loads of the fish and salt which the sea furnished them to the mainland. They exchanged these for food and clothing. They could not be an agricultural people or a mining people. From the very first they had to be a trading people, a business people.

So they continued trading. They went to points on the mainland, got boatloads of the products of those places, took them to other places and sold them. Each time, they made a profit.

In this way this poor tribe on its muddy islands grew into a great and powerful people, the Venetians. They built one of the most beautiful cities in the whole world. Venice stands to-day upon those same islands. Thousands of people visit it yearly, just for its beauty. And to see it tourists spend millions of dollars.

It is a city in which all the streets are water. The travel and transportation are all by boat. The houses of Venice are not of wood or stone. They are of white marble. They stand at the very edge of the water, and the boats come to the steps, as carriages drive to the door in other cities.

For hundreds of years, Venice was one of the richest and most powerful countries in Europe. Its shops and houses were full of beautiful and costly things. Its ships traded in every sea. Its manufacturers made the finest goods in Europe. Its lace, jewels, goldwork and glassware were famous. Specimens of this work are kept in museums to-day, to show how beautiful the work was. Venice had great artists, writers, inventors, soldiers, seamen and statesmen.

Few people have ever heard of the Anniviards. The whole world knows of Venice. Venice became what it is because it was a dependent community. It had to trade with other communities to live. And with constant travel, constant buying and selling among the people of every land, it grew intelligent, rich and civilized.

England is a very dependent community to-day. It depends on other countries for its food. It sells manufactured goods to other countries. New York and Chicago, London and Paris, and all cities in the world to-day, depend on commerce with other communities. They do not produce all they use.

Little independent communities that raise all they use do not enrich the world. It is the great trading cities which have accumulated wealth, art and learning.

Venice is an example of the trading city. Let us study a city of another type. In the north of Italy, not very far from Venice, is the city of Milan. Riding from Venice to Milan on the train one sees from the window a broad green plain, as level as a floor, and running across this

plain, long lines of poplar trees. This is the plain of Lombardy, and these are the famous Lombardy poplars.

The Lombardy plain is one of the most fertile regions on earth. For more than two thousand years this plain has been producing rich crops of grain, wine, flax, hemp and mulberry trees to feed silkworms. From the Po River the farmers dig ditches, called irrigation ditches, to water their meadows. These irrigated meadows have been known to produce nine crops of grass in a year. When you remember that our northern states produce only one, you will see what a rich farming region Lombardy is.

The Anniviards in their Swiss valley can raise no more than they need for themselves. But on the rich Lombardy plain the farmers cannot possibly use all they raise. They always have something to sell. Where, in the early days before there were cities and railroads, did they go to sell their supplies?

A certain point on the Po River proved most convenient. Many could reach it by boat. To the north lay the great mountains of Switzerland,

the Alps, and right back of this point was an opening into the mountains. This opening was a great natural passageway, through which the people could travel over the mountains easily. Such an opening is called a pass. Through this pass the mountain people who had wool, cheese and hides to sell, came down to the trading point on the river.

At this convenient trading point, the people of the plain and the people of the hills would meet and exchange their products. Each had something that the other did not have, and so it was a benefit to them to exchange. They were not traders, like the Venetians, buying in one place and selling at a profit in another. They were farmers and herdsmen who took what they had to sell to market and sold it there.

At this convenient point where people met to market their produce, a market town grew up. This market town became the great city of Milan. There was a city there two thousand years ago, and there is a city there to-day.

This is an example of a market city; a convenient point where surplus products are sent to be

"This Market Town became the Great City of Milan."

sold and distributed elsewhere. Most country villages and small cities start in this way. The farmers round about need a convenient point at which to sell their surplus products and buy what they need. A little market town grows up there. If the region is large and rich, the market village becomes a city. If not, it remains a country village.

The farmers' wives around Milan wove as much of their wool as they needed into cloth for their families. But since they had more than they could use, the rest was taken to Milan to sell. Here men settled who did nothing but weave. They had taken up the women's work of weaving, and made a business of it. They settled at Milan because they found plenty of wool there. They found that this wool was very different. Some was fine and soft, some harsh and coarse. They sorted the wools, and learned to make different fabrics. The fine soft wool they used for merinoes and cashmeres. The coarse they kept for heavy goods. So Milan became a centre of woollen manufacture.

In the same way it became a centre of silk

manufacture, because the farm women round about raised silkworms and had silk to sell. Our word "millinery" comes from "Milan," because it used to be a great place for the manufacture of ribbons and all such trimmings as are used on women's hats and dresses.

It also became the centre of another kind of manufacture, the manufacture of weapons. And the reason is easy to see. Here was a great, rich city, on a wide, level plain. It had no mountains or sea to protect it. Any one who was strong enough could walk up and take possession of it. So to defend their city the Milanese had to become great soldiers. And they had to have plenty of good weapons, or "arms," as they are called. So Milan was full of armorers, making the finest swords and shields.

Two things we find in every city, trade and manufacture. The city does not produce. It buys and sells the produce of the farm, sea and mine, and makes these products up into manufactured goods.

The great city of Rome, in Italy, which for many hundred years was the most important city in the world, began as a little market town.

On seven hills round about lived seven little wild tribes. They came together to buy and sell on a low flat place between the hills. This was the market-place. After the seven tribes had become the Roman people, and the city of Rome had spread over all the seven hills and all the ground between, this market-place became the Roman Forum, full of splendid buildings, the heart of Rome. From here the Roman armies marched away to conquer Europe. From this spot roads led in all directions.

Trade, the buying and selling of surplus products, has done more to teach man about the earth he lives on than any other occupation of man. It has made him travel. It has made him seek out new places on the earth, and new ways to get there. It has made him explore sea and land. You all knew that it was to discover a shorter and cheaper route to India that Columbus sailed west and chanced to discover America.

The traders and business men of that day were very much disappointed when they found it was a new continent Columbus had discovered. They

did not want a new continent. They wanted a quick route to India.

They kept on trying to find this short route to India. The first man who sailed up the Hudson River was trying to find a way to India. The first men who sailed among the frozen islands north of Canada were trying to find a way to India. The Frenchmen who first sailed up the St. Lawrence, crossed over, discovered the Mississippi and sailed down that, were trying to find India. All this exploration and discovery was made to find India, to get shiploads of the rich products of India to take home to Europe and sell. They were always trying to get past this troublesome new continent that stretched up and down the western seas, blocking their way.

They did not find India, but they learned a great deal more about this earth we live on than anybody had ever known before. And all this travel and new knowledge made the people of Europe more intelligent than they had ever been before. Some of the greatest books were written in those days, and some of the greatest inventions were made.

The Splanish explorers of those days kept to the region around the Gulf of Mexico. They kept hunting for the short route to India, just as the French and English did farther north. One day a Spaniard named Balboa struggled through a tropical jungle and up a steep mountain on the narrow neck of land that joins North and South America.

At the top he looked westward; and there, to his astonishment, he saw another ocean. He had left one great ocean behind him, the Atlantic. Here was another, that no one in Europe had ever seen or heard of. No one knew there was a Pacific Ocean. No one knew there was water on the other side of America.

Balboa went back to his ships, took them to pieces, took them piece by piece across the Isthmus of Panama, put them together again, and launched them on the new ocean. So he was the first white man to sail on the Pacific.

From that day white men began to try to find some way to cut through the Isthmus of Panama, so that they could sail their boats from the Atlantic to the Pacific by a shorter route to India. As

early as 1581, the Spanish made a survey, to see if they could not make the canal. Ever since then men have been talking and thinking about this. In 1881, exactly three hundred years after the first survey was made, the French actually tried to cut the canal.

The French failed. But on May 24, 1913, two steam shovels met in the Isthmus of Panama. You have seen a man turn up a spadeful of earth on a shovel. A steam shovel tosses off tons of earth just as easily.

For nine years the government of the United States had been building a canal across the Isthmus of Panama. At last the shovels met. One of them came from the east, and one from the west. When they met, thousands of men stopped work and swung their hats, and hundreds of steam whistles shrieked out the news. The thing was done. The dream of three hundred and thirty years had come true. The short route to India, which Columbus started out to find in 1492, had been discovered.

But this route is not to India alone. It is to China and Japan, to Australia and the

Philippines, to Hawaii, and particularly to California.

The largest ocean ships will pass through this canal. The long, dangerous voyage down around South America has to be made no longer. Ships going from New York to San Francisco will save eight thousand miles of travel, and three thousand dollars' worth of coal. They can make several more trips a year.

Ships sailing from New York to Australia and New Zealand now go down around the southern end of Africa. By the new canal, when it is in working order, they will save five thousand miles of travel. From New York to China, one thousand, three hundred and thirty-nine miles are saved; from New York to Hawaii, six thousand, five hundred and eighty-one miles. To feed the millions of England, the canal brings the wheatfields of Washington, Oregon and California six thousand miles nearer Liverpool. Man has cut a hemisphere in two. He has brought the two sides of the world thousands of miles nearer together.

Some years ago, as we have read, the French did

the same thing between Asia and Africa. The Isthmus of Suez, which joins those two continents, was cut through by a ship canal, so that ships could get out of the Mediterranean Sea down into the Indian Ocean, without going around Africa.

These two canals are among the greatest conquests of man over nature. The continents that nature joined together, he has cut asunder. He did it by means of iron, coal, steam and machinery. He did it for his trading ships, that he might buy and sell more quickly. What a change from the day when the primitive trader took a little load of goods in his boat or a little pack on his horse's back, and started timidly forth to sell them to the next tribe!

o

CHAPTER IX

Money, Trade's Tool

WE have been reading a great deal about trade, business, commerce. We have seen how they have built up cities, how they increase wealth and how men have explored the earth and cut in two the continents because of them.

Have you ever thought that there could not be all this trade without money? Money is the thing that makes world-wide commerce possible. Man could not become a trader until he had coined money, or invented a substitute for it.

What is money?

To answer this, suppose that a market gardener who raises cabbages wants to buy a pair of shoes. He puts a load of cabbage on his wagon, takes them to the shoe man and asks to change them for a pair of shoes.

The cabbages are good, but the shoe man does

not want any cabbages. He refuses to let the cabbage man have any shoes.

You can see that we could not do business in any such way as this. Everybody who had any surplus product, flour or apples or shoes or cloth, which he did not want, would be running about trying to change it for something that he did want. Everything would be in endless confusion. At the door of the theatre would be a crowd of people with all sorts of things that they wanted to exchange for theatre tickets, and the ticket man would go crazy.

You can see, then, that there must be one thing that everything else can be exchanged for. And this thing must be used to buy everything else.

This thing we call money. The market gardener sells his cabbages for money. Then he takes his money and buys his shoes. Then the shoe man takes this money he has received and buys whatever he wants with it. So the same dollar or the same five-dollar bill passes from hand to hand, buying something to eat or wear or make him comfortable for each one who has it.

Perhaps you decide from this that money is the most valuable thing in the world. But money in itself has no value.

If you were shipwrecked on an island where there were no people, what good would a million dollars be to you? You could not buy anything with it. You would give it all for a ship to come and take you away. If there were no food there, and you were starving, you would give it all for a loaf of bread.

Money is valuable only because you can exchange it for what you want. If you could exchange cabbages for what you want, cabbages would be just as valuable as money, though they would be very heavy and inconvenient to carry around.

When you pay five dollars for a railroad ticket, you do not pay five dollars for a little piece of pasteboard. You pay five dollars for a long ride on the railroad. The ticket simply shows the conductor that you have paid.

In the same way the five-dollar bill itself is a sort of ticket. In itself it is nothing but a piece of paper. It is valuable because you can go

wherever there is anything for sale and buy five dollars' worth for your five-dollar bill.

A loaf of bread has what we call intrinsic value. You can eat it. A coat has intrinsic value. You can wear it. A ton of coal has intrinsic value. You can burn it to keep you warm.

But the five-dollar bill has no intrinsic value. You cannot eat, wear or use it for anything. Even if your five dollars is made of gold, it has not much intrinsic value for you. You cannot use it unless you take it to the jeweller and get it made into a ring, pin or something like that.

But as we have said, the value of money is an *exchange* value. It is valuable because you can *exchange* it for other things.

Our money is made of gold, silver and paper, and we have also the little copper cent and the nickel five-cent piece. Most civilized countries make their money of these materials. But money may be made of anything. At different times in the world's history it has been made of bronze, iron and leather. The North American Indians were using strings of sea-shells for money when

the white men came. They called their money *wampum.*

Money can be made of any substance that people agree upon. The government makes the money, and makes a law that this money shall be accepted in payment for anything you buy, or any debt you owe.

When a boy swaps a knife for a kite, this is barter. For a long time mankind exchanged things by barter. They swapped things they didn't want for things they did want. They got along without money. But as they wanted to exchange a greater number of things, barter grew very inconvenient. They saw that they must have a *medium of exchange,* some one thing which could always be exchanged for everything else. This medium of exchange should be something small in size, light and easy to carry about. People began to use pieces of metal for this purpose, and so money was invented.

The invention of money was not exactly a conquest of nature. It was a conquest of *inconvenience.* It was very inconvenient to always have to barter one kind of goods for another.

It was so inconvenient that it was almost impossible. Money made it possible to buy and sell on a large scale. It made trade possible. It made commerce possible. It made cities and civilization possible.

CHAPTER X

The Greatest Conquest of All

WE have seen man conquering the distance. We have seen him overcoming inconveniences. But there remained something far more important for him to do. He had to overcome ignorance.

Food, clothing, houses, railroads, steamers, telephones and such things are not all there is to civilization. Such things as these are called material civilization. They are made of various materials. You can see them, touch them, handle them.

But if you have read this book carefully, you know that there is something else more wonderful and more powerful than all these, something you cannot see, touch or handle. Something conquered all other things from nature. Something discovered all the secrets of nature; the coal stored away deep underground, the steam, elec-

tricity and water-power. Something has been at work from the very first, lifting, lifting, lifting man above the other animals.

What is this?

It is the thing inside of the head that thinks. It is the mind which has conquered nature. The mind is the most wonderful creation in the universe.

Do you remember how for a long, long time, thousands of years, man seemed to rise very slowly? For thousands of years he kept to slow, hard ways of doing things. After thousands of years upon this earth, he had only the work animals, the sail, the water-wheel and the windmill to help him. In all those years the white man had explored only Europe and a little edge of Africa and Asia. He did not dare sail his boats out into the ocean. He crept timidly along the shores. He did not know the earth he lived on was round.

Suddenly the white man began to go forward very fast. He discovered America. He sailed around the world. He explored every corner of the earth. He discovered coal, steam, electricity,

and changed the face of the earth with his machines. He stopped the old, slow tiresome ways of doing things by hand, and began to make nature herself do things for him.

All this he has done in the last four hundred years. Most of it he has done in the last one hundred years. He has advanced more in the last fifty years than he did in all the time before.

Why did the white man suddenly begin to move so much faster?

One reason was the help which came to him through the invention of printing. Perhaps you have seen toy blocks made for a little child, with the letters of the alphabet painted on them. Now suppose that instead of being painted on, these letters of wood were raised above the rest of the block. If you covered this raised letter with ink and pressed a paper on it, the letter would be printed on the paper.

The first printing was done in some such way as this with rude wooden blocks. These awkward, clumsy wooden blocks were the most valuable of all the inventions of mankind. No wonderful machine in any of our factories, no steam engine

or electric plant or wireless telegraph, no airship flying through the air like a bird, no coal or iron or gold or jewels is so valuable to man as printing.

Printing is the art that *preserves knowledge.* If the knowledge of all invented things is once printed in books, then man possesses this knowledge forever. It cannot escape him. He knows how to find the ores and metals, he knows how to make the machinery.

But if there were no printing, the knowledge of these things could be lost to the world. Many such inventions have been lost. Men have discovered how to do or make useful and valuable things, then they have died, and those who knew about their discovery died, and the knowledge has been lost to the world. Many useful and beautiful arts have been known to man in the past, and have been lost, not to be discovered again for hundreds or perhaps thousands of years. The ancient Egyptians possessed a great deal of this lost knowledge.

It is true that books can be written by hand; men wrote them in this way before printing was invented. But it takes so very long to write a

book by hand that without printing there could be only a few books in the world. If a valuable book were written, there would be perhaps only half a dozen copies of it in the whole world, perhaps only one. If this copy were destroyed, the knowledge in the book would be lost.

The Egyptians once had a great library at Alexandria, full of thousands of books, all written by hand. This library was burned in a war. There were no other copies of many of these books anywhere. All the knowledge contained in them was lost. To-day, if a library is burned, the knowledge contained in the books burned is not lost. There are other copies of the books scattered over the country because, with printing, thousands of copies of the same book can be made.

To-day we laugh at a grown-up person who does not know how to read. We call him "illiterate," and do not think much of him. But in the days before printing, many kings and queens could not read and could not write even their own names. Books were so rare and costly then that most people had no way of learning.

It was not possible to get knowledge to the

people. Almost everybody was illiterate. People knew nothing about the world they lived in, they knew nothing about their own bodies, they knew nothing of history, or invention, or exploration, or discovery. If some wise man by a lifetime of study found out something useful, there was no way to make it widely known, and when he died it was probably lost. Now when any new or useful knowledge is attained, it is printed and millions possess it.

We are not sure who discovered printing. The Dutch claim that a Dutchman named Coster discovered it in 1426. The Germans claim that a German named Gutenberg discovered it in 1438. Perhaps it was discovered in the two countries at about the same time.

We do know that about this time white men found out how to print, and that books began to be printed and scattered over Europe. It was all very slow, and the books cost a great deal. But still there were printed books in the world, and more people read and studied. There were more schools, and more people went to school. As this went on, things that had never happened

before began to happen. The biggest thing was Columbus's discovery of America. Columbus, a sailor and the son of a working-man, was not an ignorant man. He had been educated at a great school at Pavia, Italy. After his discovery of America, began that great era of exploration and discovery, when men ventured to every part of the world. At the same time some of the greatest books the world has ever had were written and printed. People everywhere began to read, study and learn. A thirst for knowledge set in. This time of widening knowledge was the beginning of modern civilization.

We have called our age the age of coal, the age of steam, the age of machinery, the age of invention, the age of electricity. We can call it by yet another name, the age of printing. Without printing, and cheap, quick printing, which can turn off millions of cheap books, newspapers and magazines, so that the world is full of reading matter and almost everybody knows how to read, we could not have civilization as we have it today.

Some of the most wonderful of all the inven-

tions have been made in the art of printing. Coster and Gutenberg with their poor little wooden blocks four hundred years ago, could not believe their eyes if they saw our printing-presses to-day. If you live in a place where there is a daily paper, you should go to the office when they are printing it and see the papers pouring off the press, all printed, folded and ready to sell, almost faster than you can see.

The only people who still print with the old wooden blocks used by Gutenberg four hundred years ago are the Chinese. The Chinese knew how to print long, long before the white man did. There was printing in China more than a thousand years before Coster and Gutenberg invented it in Europe. But it was a very poor, slow method of printing, done by hand, and it has not improved. It is not even so fast or so good as Gutenberg's printing was.

The Chinese are a very strange people. Thousands of years ago they had knowledge that the white man did not possess till long afterwards. They knew the use of coal, of gunpowder, of printing, besides other things, thousands of years

before the white man did. But they did not do much with this knowledge, and they did not

The First Printing was done with Rude Wooden Blocks.

improve their inventions much. Just as the Chinese printed at first, so they printed when the

white man discovered them. Now they are learning from the white man the modern way of printing. The Chinese seem to have reached a certain point in civilization and to have stopped there until the white man came along and showed them how to proceed.

If in early days men had been able to get about over the earth by means of railroads and steamships as they do now, the knowledge the Chinese had would have been brought to Europe, and the world would have progressed a great deal more quickly and easily.

But men could not then travel about. For thousands of years there was no travel between China and Europe. Over on the eastern coast of Asia were the Chinese, with many useful arts and inventions which it would have been very good for the white men to know, and the white men did not even know there were any such people as the Chinese.

But in very early times, even, a few men penetrated to China. These were not scholars, seeking for knowledge. They were not rich men, travelling for pleasure. They were traders who wanted

to buy something in China which they could sell at a profit in Europe. The thing they wanted to buy was silk, made first in China. The women there tended the silkworms and made rich and beautiful silks, as we read when we discussed man's clothes.

Now just suppose, instead of silkworm eggs, that these traders had brought a knowledge of printing out of China. Suppose that instead of silk, which does little good, they had introduced printing into Europe one thousand years before Gutenberg discovered it. Then these European countries would have started on the road to modern civilization long before they did. To a great extent the history of the world would have been altered.

CHAPTER XI

Why Our Race has Conquered

THROUGHOUT this book we have talked a good deal about "white men." We have seen how white men have built up the civilization we have. We have seen how white men discovered the use of coal, steam and electricity, and invented the wonderful machinery we are using to-day. We have seen how their countries are manufacturing countries.

All the races of the world have not progressed like this. Some of them have stayed behind. They have moved only a little from their starting-point.

To understand this, let us study the life of one tribe living to-day. Let us take for this study a people called the Fans, who live on the river Ogowe, near the equator, in Africa.

The Fans always build their villages near the river, because they have not learned to carry

water in pipes, or to store water in tanks or cisterns, or to dig wells. They must, therefore, live near water.

The Fan village consists of two long rows of houses facing each other, with a street or path between. At each end this street is closed by a wooden guard-house, where on the coming of an enemy, the men collect to defend the village.

The houses in these rows are joined to each other. They do not stand separate. They are very simple, for they are made by driving posts into the ground. To these posts is fastened a light framework of branches, and the whole is covered with a mat of leaves sewn together. The doors are of bark, tied on with vines. The Fans use no nails or hinges.

Behind each house is a little garden, where the women raise a few banana plants, sweet potatoes, and so on. These little gardens do not furnish enough food; the Fans have other ways of getting food.

All around the Fan village is a vast tropical forest. There are fruit and nut trees in this forest. The Fans make journeys to the trees,

where they camp out. To get possession of the fruit, the men cut down the trees, thus destroying their food supply. The women collect the harvest and preserve by cooking and in other ways as many fruits and nuts as they can.

Fish are another source of food supply. The Fans have found that certain plants will poison the waters so that the fish will die in large numbers. They throw these plants in the lakes and ponds. Then when the poisoned fish float upon the surface, they collect and eat them. They sometimes catch fish with nets. The women preserve these by drying.

But as garden, forest and water do not yield them supplies enough, the Fans must do a little farming.

For this, the men cut out a clearing in the forest with axes bought from white traders. In the dry season, they burn out all the bushes and underbrush in this clearing. They have then a patch of ground covered with soft wood ashes. The women plant in the patch bananas, corn, cucumbers and certain tropical food plants which we do not know in this country. Once planted,

these crops grow, bear and ripen, the year through. There are, you remember, no winter freezes. The Fans therefore need no granary, and there is no harvest time. The food is brought from the fields as it is needed.

But since no fertilizer is added to the soil, this little farm is exhausted within two years. The plants stop bearing and begin to die out. The wild plants of the jungle creep up and cover the field, and a new clearing must be made. After a while so many clearings have been made round about the village, so many fruit and nut trees cut down, so many fish poisoned, that food grows scarce in that part. Then the whole tribe deserts its village, goes away to some fresh spot in the forest and builds a new village there. Every four or five years the whole village must move in this way.

So you see that, though the Fans have been living in their country as long as the white men have been living in theirs, they have built no cities or roads, they have no writing or printing, and so no schools or books. They have no sail-boats, wagons or domestic animals. You see

that they are still mainly in the collecting stage, which the white man left thousands of years ago.

Some years ago white traders penetrated into the region where the Fans live. The Fans now collect for these traders rubber, ebony, and other products of the forest. In return they receive guns, axes, and other manufactured goods. To this extent they have taken on the white man's civilization.

Throughout the tropics are races that have remained in much the same condition as the Fans. They have never become civilized. Why is this?

The white race advanced in civilization because its home was where nature was not too strong. If its home had been Africa instead of Europe, perhaps the result would have been different.

Let us examine into this. The Esquimaux live in the frozen North, where for many months each year the sun never shines. We do not expect the Esquimaux to cultivate their soil. How could they be farmers, when the sun does not shine enough even to melt the frozen ground for the planting of seed?

We think the Esquimaux do very well to live as they do, to build their huts of snow, to get food and clothing from the fish, seal, walrus and polar bear, in a country where nothing grows to give them food, clothing or fuel.

In the country where the Esquimaux live nature is too powerful, with her frozen earth and six months' night. Man has not been able to conquer her enough to make her give him the comforts of civilized life. It is not his fault. He has done, perhaps, as well as he could.

To understand how civilization may stand still in a land where it is always winter is easy for us. But when we think of the lands near the equator, the case seems very different. There it is never winter. There vegetation grows the year around, producing a boundless supply of luscious fruits. It seems to us that life ought to be easy there, and that man should find it easy to progress to higher and higher civilization.

But the fact is that it is harder to conquer the tropics than it is to conquer the frozen North. Even the white man has not conquered the tropics. We do not know that he ever will.

In tropical regions plants grow too readily. They grow too fast; they grow all the time. And, naturally, they become extremely large. If a man should spend the whole day cutting them down, in the morning they would be grown up again.

You remember how important civilized man has found roads. He cannot get about without them. He cannot travel or transport his goods without roads. He cannot have trade or business or cities without roads. All civilized men have had roads, and good ones.

But it is impossible to have roads in the tropics. When man tries to cut a road in the tropical forest, it grows over almost while he is working. In a few days the whole road is grown over again, and all his labor is lost. He gives it up in despair, and travels about only on the rivers. Back from the rivers lie vast regions where there is no travel. Of course there can be no trade, no commerce, no cities, no civilization, where people cannot move about from place to place.

If you are ever in the country, you will sometimes see a field on the edge of the woods. In

the field there will be little trees starting up all over the side next the woods.

A farmer once cleared this field. He cut down the trees and cut them up for lumber or fuel. He burned out the stumps. Then he ploughed the land, planted his crops, kept out weeds, fertilized the soil, and made the ground produce crops for years.

But he has been neglecting the field, and the forest has begun to take it back. Every summer, more little trees spring up in the field. If the farmer does not cut them down, in a few years the field will be a forest again.

In our country it will take the forest years to conquer back a field in this way. But in the tropics the jungle will grow over a field in a few weeks, in a few days, even. How can man become a farmer in such a country?

Take your map and find Brazil, down in South America. It is a large country. The equator passes across it. The climate is very hot and very wet. The earth in places fairly steams with heat and moisture. There is room for countless millions to live. Yet very few people

live there. On the seacoast are a few large cities. Back from the coast there is hardly a settlement.

Why is this? To find out, let us take a little trip to the forests.

In Brazil is the largest river in the world, the mighty Amazon. At its mouth the Amazon is a hundred miles wide, a distance as great as that from New York to Philadelphia.

We take a steamer up the Amazon. As we sail along we see nothing but an unbroken wall of forest trees on either side. You will remember how we learned that mankind has always lived along the rivers, and how to-day the river banks of China are like long streets, with houses and villages all the way. But here on the banks of the Amazon one sees not a sign of human life.

Why is this?

Let us get out at some point and try to push back into this forest. We will find that we cannot walk among these trees as we can in the forests of the North. Instead, we find a solid wall of living green in front of us.

From tree to tree spring vines, and these vines are giants. Their stems are thick as tree trunks.

No man can break them with his hands. He must have an axe or heavy knife to cut them. We cannot walk one step into this forest wall without some tool to cut away the vines.

If we begin to cut, we must keep on cutting. We can walk only as we cut away the growth before us. Sometimes we will come upon a huge tree fallen across our path. This tree must be sawed through with a saw handled by two men, or we must go many hundreds of feet out of our way to get around the end of the tree.

As we go on, we will see nothing of the forest around us. On either side we will see only that high, solid wall of living green, in which we cut a little path just wide enough to slip through. And if we walk three miles through this forest in a day, we will do well indeed.

Such is the tropical forest of the Amazon, which covers thousands of square miles. And such forests as this occupy large parts of Asia and Africa. Man cannot live in these forests. He cannot conquer them. They conquer him. Instead of friends and helpers, the plants become terrible enemies, waiting to kill him.

Why cannot he burn these forests down? Because they are too wet to burn. The trees and plants are always green, full of life and sap. There is no winter, no dry season to dry them out. We saw the Fans burning out little clearings. But in the country of the Fans there is a season when the trees dry out a little. In many tropical forests no season stops the growth in the trees and drys them so that they will burn.

In this tropical forest it is dark as night. The foliage is so dense, the plants grow so thick and close, that no light can get in. To get the light the trees and plants keep growing up, up, up, to find the sunshine above the woods, and this makes the forest enormously tall. Everything is gigantic; trees, vines, flowers and shrubs. So the forest is all the harder for man to handle. American farmers are now cultivating dwarf apple trees, because a man can stand on the ground and pick the apples. If men find trouble handling the little apple trees of our orchards, what must it be for men to try to do anything with the enormous trees, hundreds of feet high, of the tropical forest?

THE JUNGLE.

Where man cannot conquer the plant, he cannot conquer the animal. In these dense tropical forests there are no wild sheep, goats or horses, useful animals which can be domesticated. Such animals cannot force their way through the jungle. They must have plains or mountains to range over. Here are creatures that can live in trees, or glide along the earth, slipping and twisting between the vines. Such a jungle as this is the home of the fierce wildcat, of the huge and deadly serpents of the tropics.

So travel through the tropical jungle is not only very difficult, but very dangerous. For man, though he has conquered the wild animal in Europe and America, has not yet conquered the wild animal in the tropical jungle, and perhaps never will. India is a very old country. For thousands of years it has had great cities. But there are also tropical jungles. So even yet, though India has for so many years been settled and civilized, and though the English have been in control for a hundred years past, thousands of people are killed each year by tigers and snakes.

The elephant is the only animal big and strong enough to crash through the jungle, smashing his road before him as he goes, instead of climbing over or under it like the cats and snakes. The elephant is king of the jungle. There are no elephants in South America, but in the jungles of Asia and Africa there are many.

Far worse than tigers and poisonous snakes are the insects of the jungle. Flies and mosquitoes only bother and annoy us here, but in the jungle the insects sometimes kill men. Some of them are bloodsuckers. Others poison the blood.

Others lay eggs under the skin, producing dreadful sores. No food can be kept. They destroy it in a few moments. Out of the jungle they would come in millions to destroy a garden. No one can sleep without protection from them. They come in clouds, and bite and sting the sleeper to death. If a white man tries to have a civilized house there, they eat out the inside of all his furniture, so that his chairs and tables all fall to pieces. If he takes up a book, he finds the inside nothing but powder. They even eat the house itself, so that it tumbles down about his ears.

Man has not overcome the tropical insect. Perhaps he never will. He cannot conquer the insect until he can conquer the forest where it lives.

There is another strange thing for us to learn about the tropical forest. Boys and girls who live in our northern states sometimes go beechnutting in the fall. They know that they will find beechnut trees growing together. It is so with hickory nut trees. The sugar maples grow in groves, so that the farmer can easily tap the trees in spring and make quantities of maple

sugar. In northern Italy there are large groves of chestnut trees. The ground beneath them will be covered with chestnuts in the fall, and the farmers can gather many bushels of the big, sweet chestnuts, which are very good food for both man and beast.

Perhaps you think that in the tropical forests groves of bananas and other food trees grow? Perhaps you think it must be easy to find wild foods in the jungle?

Instead, it is very hard to get food in the jungle. With millions of plants and trees all around him, one would be almost sure to starve there, if he did not take food along.

Our northern woods are thin. The trees are far apart. The underbrush is not thick. There is always plenty of room on the ground for a new plant to take root and start up. So a tree drops its seeds all around it, and new trees spring up, and make a grove of the same kind of trees.

But in the jungle, the earth below each tree is so crowded with plant life that the seeds of this tree can find no room to live. The only chance for a seed to take root is for it to be blown away

by the wind until perhaps it finds some open space.

So in the tropical forest there are not groves of one kind of tree. The trees that you see around you in the Amazon jungle are of different kinds. You may have to hunt a long time for a food tree. And when you have found it, you may have to travel a long way before you find another of the same kind. This is one reason why it is so difficult to get food in the jungle.

The jungle is full of the most valuable trees, trees which would sell for a great deal of money in our cities: ebony, satinwood, rosewood, mahogany, and many other costly woods, used by us for pianos and other expensive furniture. They all grow in the tropical forests, but the trees grow singly, and are so far apart and so very difficult to get that we have little of this beautiful lumber. Hence the price for it is high.

To-day white men are searching the tropical forests everywhere for rubber, which is more necessary to us than all the beautiful cabinet woods.

Until Columbus took rubber home with him

after his second voyage, the civilized world had not known anything about it. The Spaniards were the first white people to use it. They began to use it four hundred years ago to make raincoats. Ever since, white peoples have used a little of it for raincoats, overshoes and such things.

But a few years ago the civilized world began to use rubber in immense quantities. We cannot get along without rubber any more. We must have it, just as we must have coal and iron. The invention of the automobile has made rubber a necessity.

The man who can find a way to make artificial rubber will become one of the richest men of any age. Inventors are trying all the time to find out this secret, but so far they have not succeeded.

Other men are trying to have plantations of cultivated rubber trees. But very few are engaged in this. So the tropical jungle is still the source of rubber. And, because of this, rubber is expensive.

Rubber comes from a tree that grows in the jungle. If it grew in groves and woods by itself,

it would be much easier to get it, rubber would be much cheaper, and many more people could have automobiles. But the trees are scattered, one or two in a place, over a vast forest, and men must hunt the forest over to find them.

The forests of the Amazon are the home of the rubber tree. Let us visit a rubber station on the Amazon.

Our boat stops at a dock or wharf in the midst of the forest. There is no city or town there. But there is a mill where the rubber sap collected in the forest is made into large cakes to be shipped away. Near this mill there are an office, a store, and some dwellings round about for the white men who are managing the business.

This is the central office of a rubber estate. The estate belongs to rich men who live probably in New York, London or Paris. They own fifty or seventy-five miles of tropical forest, stretching up and down the Amazon River. They send a few white men, Americans, English, French or Germans, to take charge of the estate. They bring labourers from Brazilian cities down on the coast, hundreds of miles away, for no one lives in

the jungle itself. They bring all their food by boat, and they also bring a great deal of medicine, and have a doctor there to take care of them, for most white men are sick in the tropics. Everything they eat, wear or use comes hundreds of miles, perhaps thousands of miles, by boat.

Rubber is the milky sap of the rubber tree. The tree is tapped, like the sugar maple for the maple sap. The collectors go in canoes up the smaller rivers that flow into the Amazon, and make camps in the forest. They take with them supplies for weeks. They wander about the forest, find the trees, tap them, collect the sap and take it to camp. All around them while they work is the dreadful jungle, full of insects and serpents. Sometimes the collectors fall sick and die alone.

At the central station, the workmen must buy what they need at the company store. The company charges them what it pleases. So that, after all his hard work and danger, the poor collector often finds that he has no money at all, and is even in debt to the company he has been working for. He is really a slave. The rubber

THE RUBBER TREE IS TAPPED LIKE THE SUGAR MAPLE.
(230)

company does not buy and sell him like a horse, as they used to do with the negro slaves, but it keeps him in slavery because it keeps him always in debt.

Such till now is the white man's conquest of the jungle. He does not conquer it so as to make farms and homes. At present, he cannot. He goes to the jungle for a little while, to get some special thing that he wants. He takes with him on his steamers food and medicine from civilized countries. He enslaves the native labour, as much as he can, gets what he wants and goes away. Through the tools and machines he brings with him he can master the jungle to a small extent. But if he were thrown into it alone, with only his two hands to defend him, he would perish miserably.

The white man has probably not gone ahead of the rest of the world because he was, in the first place, naturally superior. He has gone ahead because he lived in a part of the world that would let him do so. He has lived between the hot countries and the cold ones, in the temperate zone. Here he has found a climate that gives

him energy, land he can cultivate, conditions under which his crops grow well. Nature has not given him freely enough food to make him lazy, but she has furnished him all he needs for his labour. And these have been causes in his triumph.

But will his triumph ever be complete? Will he conquer the tropics, too, some day? That is a question, and we do not know the answer to it.

For the hardest thing for man to overcome in the tropics is the effect of the tropics on himself. Life in the tropics changes man himself. He loses his power to work, either with his body or his mind. An American who works very hard in the United States, after living for some years at a rubber estate on the Amazon, finds that he does not want to work at all. He does not even want to read or think. This is the effect the climate has on the white man.

In the frozen North, if he can have fuel, man can live and work very well. With warm fur clothing for out-of-doors, and coal enough to heat his house, he can live and work just as well as he does in the temperate zone. White men are

living so in Alaska. The gold of Alaska gives them money to buy all the comforts of civilized life, and they themselves are strong and vigorous in the cold climate.

But in the tropics no money can buy a comfortable life. No money can purchase cool weather, and heat and damp will kill the white man in time.

Why did the white man leave the great continent of Africa at his very door, sail three thousand miles across the stormy Atlantic in his poor little sail-boats, and conquer wild, savage North America, so far from his home and from civilization?

Because America was temperate in climate. Like Europe, it was fitted for his home.

So man has built up great civilizations in North and South America, while Africa is still left comparatively wild and unknown.

But recently the white man has turned his attention to Africa. He is taking possession of it. The English have taken Egypt and other parts in the east and south. The Germans have taken a portion and so have the French and

Italians. The Portuguese have long held parts of it.

The red man could not conquer nature in America, and the white man took his country away from him.

The black man has not conquered nature in Africa, and now the white man is taking his country away from him. We do not know whether the white man will conquer nature in Africa as he has in America. We do not know whether he will be able to fill it with cities, farms and civilized homes. Nature may be too strong for him. Only the future can tell that.

The white man has conquered the red man in America, and the black man in Africa. But there has been no necessity for his conquering the yellow man.

By the yellow man we mean the Chinese and the Japanese, in Asia. They built up great and powerful civilizations in the age of hand labour. When the white man discovered them, they had rich farms and gardens, and all sorts of fine manufactured goods. But everything was done by hand. They had discovered coal, and knew that

it would burn, but they did not use it for manufacturing. They had not entered the machine age.

The white man came with his machine. The yellow man copied the white man's machine. He entered on the machine age. He is manufacturing. He is building steamships, railroads and factories. He is digging coal and smelting iron. He is using electricity. He is putting in telegraphs and telephones. He is building great schools, and printing books and newspapers.

China and Japan are countries in which nature was not too strong for man. The yellow man conquered her there, with hand labour alone. Now he is making his conquest complete by means of the white man's machine. The yellow man is keeping his own country and his own civilization, because he has been able to master the conditions under which he must live. He, too, may have a part in the conquests of the future.

CHAPTER XII

Conquests of the Future

JUST as man has conquered the earth and the ocean, so that he can go anywhere upon them with his railroads and steamers, so he will in time conquer the air. We can see in the invention of the airship that his conquest of the air has begun. Probably it will go on until man travels through the air as easily and safely as he does now in ships and railways.

You know that if you throw a ball into the air, it must fall. It cannot stay up in the air. Everything that is not, like a feather, lighter than air falls to the ground. The earth has this strange power of drawing all solid objects down to itself. We call this power gravitation.

In the airship man has conquered gravitation. This is one of his most marvellous victories over nature.

You cannot understand this victory without

"His Conquest of the Air has Begun." (237)

understanding more about machinery. You can only see that the conquest of the air has begun.

Further conquests of nature have recently begun, but have so far progressed very little. One of them is irrigation.

You know that farming is the great, basic industry of the whole world. It is the farmer who raises the food for the rest of us. All our inventions would be useless, all our railroads would stop running, all our cities would starve, if farming should stop.

You know that the farmer cannot farm without rain. If you have ever lived on a farm, you will know that at certain times the farmer watches the sky very anxiously. If the rain does not come, his crop is spoiled. Plants cannot grow without water.

West of the Mississippi River there are vast tracts of land where little or no rain falls. When people first went out there from the eastern states, they thought this section was a desert. Middle-aged people can remember that, when they went to school, on the map of the far western part of the United States were printed the words "Great American Desert."

Not until gold was discovered in California in 1849 did people from the eastern states go West in great numbers. They then made a rush across the great plains, on horseback or in wagons or even on foot, for there were no railroads there then. Many of them died by the way, and their bones lay beside the path. Many starved on the way, for there was no food in that country. Many died of thirst, for there was little water.

Those who survived found vast, dry plains, covered with thorny cactus or dry sage-brush. No trees grew. Nothing useful grew, no fruits or nuts or food-plants. So Americans thought that this land was worthless. They thought it was a desert that could never be used. They thought it was good only for the minerals to be found there.

But when men settled there as miners, they began to try gardening. And then they found that when watered this dry gray soil was a most astonishing soil. Many plants would grow here better than in the East. Fruits and vegetables would grow to enormous size. Crops such as men in the East never imagined were produced. This dry, rainless soil was wonderfully fertile.

Since there was not rain enough on these western lands for farming, men cut little ditches from the rivers. When the crops needed water, they opened these ditches and let the water into the fields. This is the art of irrigation.

Irrigation has been known to mankind for a long time. The Egyptians used irrigating ditches thousands of years ago. Irrigation has been used on the plain of Lombardy for hundreds of years. But it was used on a very small scale.

The rainless country in our western states is now called Arid America. The word "arid" means "dry." Irrigation has been used in Arid America on a larger scale than anywhere else in the world. Arizona is one of the most arid states. The whole state was once only a vast desert. But now Phœnix, the capital, is surrounded by tens of thousands of acres of irrigated land, and it is impossible for eastern people to understand how well wheat, fruits and other crops grow there. Ten acres of this irrigated soil will bring a man more money than a hundred acres farmed in the eastern states.

In southern California the arid land before it

was irrigated could be bought for seventy-five cents an acre. It was useful only to pasture sheep. As soon as ditches were built and it was "brought under irrigation," as they say, this land sold for more than $100 an acre. Covered with orange trees ready to bear, it sells for $2000 an acre, and often this land, bought for $2000 an acre, will bring the farmer back half this sum with the very first crop. The states of Arizona, Colorado, Utah, California, Oregon and Washington have been reclaimed from the "Great American Desert" largely by irrigation. There is no great American desert any more. The name has been taken out of our geographies.

But with all this, irrigation has only begun. Some forty million acres of arid soil have been turned into rich farms by irrigation. But nearly eight hundred million acres remain to be reclaimed. This arid region, which now lies worthless, would, if brought under irrigation, feed and support all the people in the United States.

Here is a great conquest for the future; the Conquest of Arid America, and of other arid portions of the world.

Great reservoirs must be built to hold water. The melting snows that run down from the mountains in springtime must be caught in these reservoirs. Every drop of rain that falls in the

IRRIGATION IS THE GREAT CONQUEST FOR THE FUTURE.

spring must be saved in them. Then when the dry season comes, these waters may be let out through the ditches to trickle gently over the land and water the crops that will feed millions.

These great irrigation systems are too costly for individuals, or even for separate states to

build. The United States government must build them.

So man will go on, extending his conquest over nature until every corner of the earth has become a productive home for man.

Another conquest of the future will be the preservation and restoration of the forests. You have seen what an enemy of man the tropical forest is. You have seen that in the temperate zone man has conquered the forest. But in his zeal to conquer the forest man has gone too far.

When the first white people settled along our Atlantic coast they found the whole country covered with a vast forest. In this forest lived wild beasts and wild Indians, ready to kill them. The pioneers had first to cut down the forest so that they could use the land for their farms. This was natural, and it was necessary. The land could not be used until the trees were cut.

But the white man went too far. He cut down too much of the forest. It has been found that without forests the land is not so good for farming.

It has been found that when the forests are destroyed there are terrible spring floods. Water

from the heavy rains rushes away, fills the rivers suddenly, makes them pour over their banks and destroy houses, villages and cities.

But when the woods are left among the hills, the thick leaves on the ground hold the water, and keep the ground damp. As the dry summer comes on, this moisture trickles down quietly and keeps water in the brooks and rivers all summer. It is especially necessary in the dry western country, where there are woods only up among the mountains, to have forest land left.

Old countries, where all the forests have been cleared, always become poor and barren. Crops are not so good. Farming becomes more difficult. The floods are high in spring. The summers are too dry. The climate changes and is not so pleasant.

So in Europe and the United States the governments have begun to preserve the forests, and to plant new ones. It is said that in Germany for every tree cut down a new one is planted. We are not yet doing as well as this in the United States, but we have begun to preserve our forest lands.

One of the ways in which forests are destroyed in the United States is by forest fires. In summer, when the trees are dry, these great fires sweep over vast areas. Large damage is done to the forests and to human life. In the fire trees which took many years to grow are destroyed in a few days. Should not children and campers who make fires in the woods be very careful to put them out before they go away?

Man has to conquer things besides external nature. He has to conquer the brute nature in him. He has to conquer his own stupidity and his own meanness.

Did you ever watch a flock of hens and chickens feeding at a farmer's kitchen door? A woman stands throwing out corn. There is plenty of food for all. Yet they all pick at each other. If the chickens are of different sizes, the bigger ones all pick at the smaller ones. Big, strong old hens are not ashamed to drive weak little chickens away from the food.

So through the animal world, except for the mothers that look after their young, everything preys on everything else. The beasts do not take

care of one that is sick, as human beings do; they do not bring food to one that is starving. They are not kind to the young, the weak and the ignorant, as humans are.

Now some human beings are just as mean and cruel to each other as beasts. We must conquer this meanness and cruelty, if we wish to lift our race above the beasts.

There was a time when all the savage tribes of man were at war with each other. Every little group was at war with every other little group. Everybody who strayed away from his own tribe among strangers was set upon and robbed and killed, or made a slave.

Later, the cities made war on each other. It was as if Philadelphia should send an army to conquer New York, and to go through its streets killing the people and burning the houses. In those days, not so very long ago, every city had a great stone wall around it, to defend it from the men of other cities who might come and try to conquer it. If you travel through Italy to-day, from the windows of the railway car you can see on the hilltops cities with these great stone walls

still standing around them. The cities do not make war on each other any more, but it has been so short a time since this stopped that their walls are still standing. And countries still make war against each other.

But as men grow more civilized, war becomes less frequent. As men grow wiser and better, they learn to settle their differences by meeting together and talking them over reasonably, instead of sending out armies of men to kill each other.

War is a relic of barbarism, of savagery. It continues only because men are still partly barbarous and savage. When we are truly civilized, war will pass away between countries as it has passed away between cities.

By what did nature mean man to rise? You can see what nature intended for each of the lower animals. She gave the horse great speed and strength in his legs. That meant he was to be a running animal. She gave the wildcats terrible claws and teeth. That meant they were to kill their prey. She gave the fish fins to swim in the water, and the bird wings to sail through

the air. She gave the rabbit no teeth and claws to defend itself against the fierce wild beasts, but she gave it such wonderful speed that it can escape and live, even though the stronger beasts all around it are hunting it.

Nature gave man no powers like these. He cannot run like the horse or the rabbit. He cannot fight like the lion or tiger. He cannot swim like the fish, or fly like the bird. Man is one of the weakest and most helpless of animals.

A baby is the weakest and most helpless thing in the world. A little chicken, no bigger than your thumb, can get its living better than a baby. Among some of the wild water-birds the little ones will jump into the water and swim away just as soon as they hop out of the shell. It is a year before a baby even begins to walk.

What was it nature gave man to enable him to rise higher than all the lower animals; what that made him able to conquer the forest, the wild animal and nature herself?

It was his wonderful brain, by which he can think as the lower animals never can. And with his brain, nature gave man a hand, — a wonderful

hand that can do what his brain directs as the paws and claws of a lower animal never can.

Man has conquered nature, and he will conquer her, by the use of his brain and hand, by thought and work. There is no other way.